1984 CORPORATE INFORMATION SYSTEMS PLANNING REPORT

INPUT

About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years' experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technically advanced companies.

Offices

NORTH AMERICA

Headquarters
1943 Landings Drive
Mountain View, CA
94043
(415) 960-3990
Telex 171407

Detroit
220 East Huron
Suite 209
Ann Arbor, MI 48104
(313) 971-0667

New York
Park 80 Plaza West-1
Saddle Brook, NJ 07662
(201) 368-9471
Telex 134630

Washington, D.C.
11820 Parklawn Drive
Suite 201
Rockville, MD 20852
(301) 231-7350

EUROPE

United Kingdom
INPUT, Ltd.
Airwork House
35 Piccadilly
London, W1V 9PB
England
01-439-8985
Telex 23116

France
La Nacelle
Procedure d'abonnement 1-74
2, rue Campagne Premiere
75014 Paris
France
322.56.46
Telex 220064 X5533

Italy
PGP Sistema SRL
20127 Milano
Via Soperga 36
Italy
Milan 284-2850
Telex 310352

Sweden
Athena Konsult
P.O. Persson & Co. AB
Box 22114
S-104 22 Stockholm
Sweden
08-52 07 20
Telex 17041

West Germany
NOVOTRON GmbH
Am Elizabethenbrunnen 1
D-6380 Bad Homburg
West Germany
(06172) 44402
Telex 418094

ASIA/AUSTRALIA

Japan
Overseas Data Service
Company, Ltd.
Shugetsu Building
No. 12-7 Kita Aoyama
3-Chome Minato-ku
Tokyo, 107
Japan
(03) 400-7090
Telex 26487

K.K. Ashisuto
Daini-Suzumaru Bldg., 6th Floor
8-1, Nishi Shimbashi
3-Chome Minato-ku
Tokyo, 105, Japan
(03) 437-0654
Telex 781 26196

Singapore
Cyberware Consultants (PTE) Ltd.
2902 Pangkor
Ardmore Park
Singapore 1025
734-8142

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Planning Services For Management

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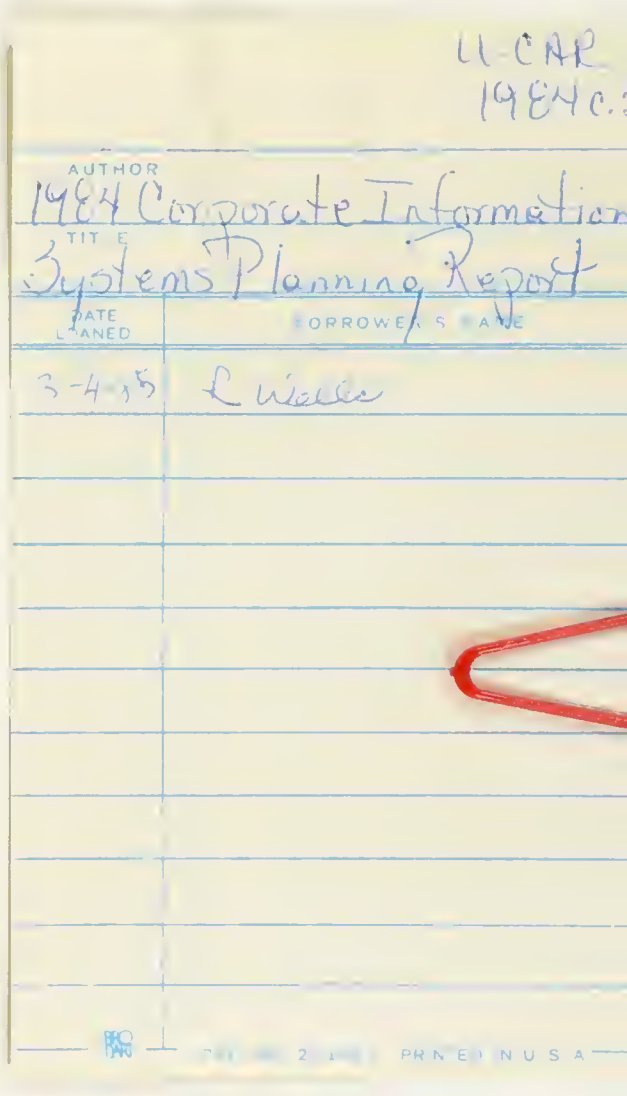


1984 CORPORATE INFORMATION SYSTEMS PLANNING REPORT

CONTENTS

1984 CORPORATE INFORMATION SYSTEMS PLANNING REPORT

EXHIBITS

I INTRODUCTION

I INTRODUCTION

- This report is part of INPUT's Information Systems Program (ISP). It is designed to assist Information Systems (IS) management and corporate management in the process of developing IS plans. It will do this by:

  - Identifying IS's role in strategic business planning.

  - Analyzing emerging IS organizational strategies.

  - Recommending approaches for addressing the IS planning issues.

A. REASONS FOR PREPARING THIS REPORT

- In the past, data processing (DP) planning was pretty much an offshoot of the annual corporate budget process. The DP managers, along with all the other department heads, would submit their resource plans through the organizational hierarchy. DP would project the resource requirements based on past growth rates and anticipated systems implementations from outstanding requests for service. Executive managers usually cut the DP budget request in favor of expenditures more in line with product development or marketing. The DP manager would have a three-ring binder labeled "Long-Range DP Plans" that would briefly discuss information systems wishes of the line management and would contain sections on mainframe hardware and

systems software upgrade plans. The DP manager and the immediate staff were the only ones who gave credence to the "long-range plans."

- INPUT believes the time is ripe to include IS in the high-level strategic business planning process, because information technology is affecting the productivity of nearly every worker and corporations have an opportunity to engage IS concepts and ideas to enhance their competitive positions in the marketplace. Senior management will be turning to IS for technology strategies, and plans for the implementation of competitive impact systems will evolve. The plans will be the joint efforts of IS management, senior management, and middle management; they will be considered equally with the plans from operational business units of the organization.

B. SCOPE AND USE

1. SCOPE

- This report examines how organizations are changing their criteria for selecting information systems opportunities from control-oriented to competitive-impact systems. It will also discuss the impact of recent technology innovations on the corporate IS planning process. This includes such areas as micro-mainframe links, office systems, and communications.

- This report addresses the following major questions related to IS planning:

  - What is the projected role of IS in corporate strategic planning?

  - What will be the impact on IS planning of distributed systems development?

- How will IS develop resource plans with the growing trend toward decentralization?

- How will the changes in the systems development life cycle affect IC planning?

- How will IS become involved in the strategic business planning process?

2. USE

- This report can be used as a reference guide in the development of tactical and strategic IS developmental plans. More importantly, it can be used as a catalyst for creative competitive impact systems planning.

- This report should be of interest to the following people:

  - Senior IS managers.

  - Senior corporate managers.

  - Corporate business planners.

  - IS applications and technical planners.

  - Business operations managers (key end users).

C. METHODOLOGY

- The information for this report was gathered from several sources.

- In-depth interviews were conducted with senior IS managers in more than 72 organizations from a variety of industries. A copy of the questionnaire is contained in the appendix.

- Use was made of INPUT's reference library of over 100 industry periodicals and 4,000 vendor files.

- Also used were the INPUT studies listed in the following section.

D. RELATED REPORTS

- Interested readers are referred to the following INPUT reports:

  - 1984 End-User Planning Report, July 1984. This report identifies strategies for supporting end-user computing and maximizing its benefits and analyzes new end-user products and systems.

  - End-User Micro-Mainframe Needs, July 1984. This report investigates the future directions of micro-mainframe products and identifies the major technological and planning issues.

  - Information Systems Implications of IBM Software Strategies, December 1984. This report studies IBM's future direction in the areas of SNA, operating systems, data base systems, languages and decision support systems, industry turnkey systems, application packages, and data/information/knowledge bases.

  - Organizing the IS Department for End-User Computing, November 1984. This report examines the major causes of the current end-user computing revolution and identifies IS actions to manage and control this phenomenon.

- Future Skills Requirements for Software Development, October 1984. This report examines the impact on IS skill requirements from the latest approaches in applications systems development.

E. REPORT ORGANIZATION

- Chapter II is the executive summary in presentation format.
- Chapter III identifies the changing role of IS from a strictly service function to a competitive weapon for corporate strategic planning.
- Chapter IV assesses the impact on IS planning brought about by the move away from the central computing environment to a more distributed IS function.
- Chapter V defines the major IS planning issues and discusses possible approaches.
- Chapter VI contains the conclusions drawn from the research and provides recommendations to IS management for developing a corporate information systems plan.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

- This executive summary is designed in presentation format in order to:
  - Help the busy reader quickly review key research findings.
  - Provide a ready-to-go executive presentation, complete with a script to facilitate communications.
- The key points of the entire report are summarized in Exhibits II-1 through II-8. On the left-hand page facing each exhibit is a script explaining the exhibit's contents.

A. I.S. CAN HAVE AN IMPACT ON COMPETITIVENESS

- The senior management teams of the more progressive organizations have started to view IS as a means of achieving a competitive edge in the marketplace. IS has become a member of the strategic business planning team and has added technological impact to the organization's strategies.

- Today more than ever before, IS has computer-based "weapons" for every facet of the business to provide responsive information to all levels of workers, with communications networks that can span the globe. Office systems, for instance, are becoming commonplace, not because they are justified by a tangible return on the investment, but because they encourage efficiency and improve internal communications; that's how the competition is beaten.

- Some organizations are content with IS as a service function and want to assure minimal risks relative to the use of computer technology. For these companies, if hard dollar savings are not apparent from a proposal, then the proposal is shelved. Approving systems proposals based only on head-count reductions is foolish, because the real opportunities lie in putting the technology to work on competitive strategies.

- Within each industry, much can be learned by studying the leaders that view computer technology as a necessary part of their businesses. An assessment should be made to determine how well the organization is doing in the delivery of computerized strategic information compared to the competition. The organization should also determine what can be done to achieve parity and to excell in these areas.

EXHIBIT II-1

I.S. CAN HAVE AN IMPACT ON COMPETITIVENESS

I.S. WEAPONS
• Technical and Business Skills • Micro/Mini/Mainframe Capacity • Communication Networks Planning • Data Management/Administration • Information Center Support • Office Systems Technology • Application Design/Development

I.S. OPPORTUNITIES
• Value-Added Service to Customers • Product Pricing Leverage • Improved Organizational Productivity • Increased Decision Support Information • Improved Systems Turnaround • Improved Time Management

B. I.S. STRATEGIC PLANNING REQUIRES TOP-DOWN AND BOTTOM-UP INPUT

- Developing meaningful IS plans in a vacuum is difficult, but it's surprising how many IS managers are still projecting resource requirements based strictly on history, without any input from the users or senior management. Some IS managers are actually attempting to put together a comprehensive five-year strategic plan in isolation. These ill-advised plans are the ones that end up on shelves gathering dust.

- With the end users becoming more involved in systems development through their exposure to microcomputers, it is important that their ideas about competitive impact systems be conveyed to management and IS representatives.

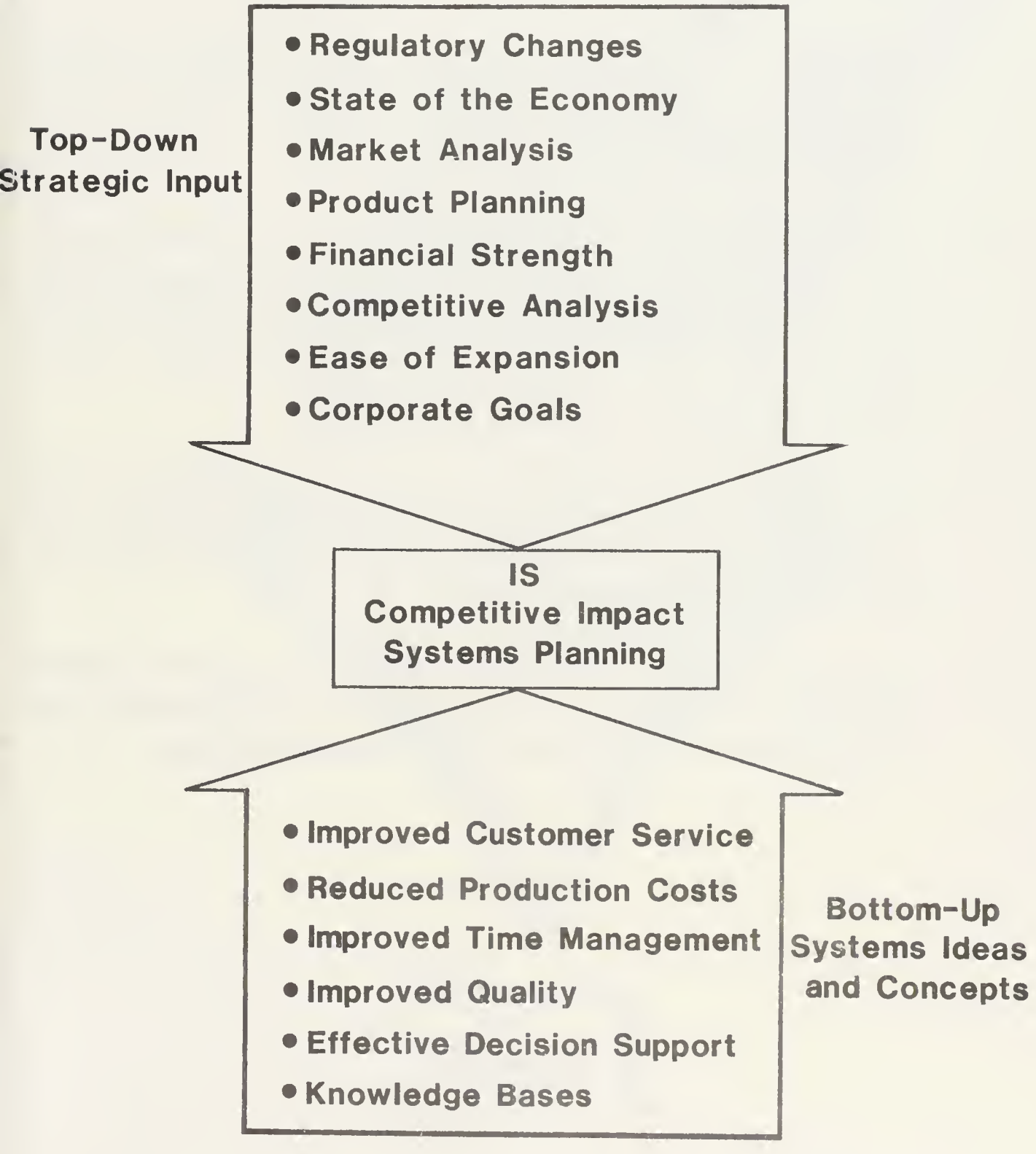
- Planning must involve a dialog between upper management, middle management, and IS. INPUT recommends actually getting away from the work environment to conduct these planning sessions. Operational deficiencies and improvement ideas should be reviewed and ranked in order of importance by senior management.

- IS should identify the risks involved in the innovative systems and provide research information on the competitors' positions in the areas being evaluated.

- Once IS has the planning input from the top regarding the corporate goals and the ability and desire to support technological innovations, it can take the ideas from middle management and develop plans. The systems priorities would have been jointly established by upper management, middle management, and IS. This approach to planning also affords IS the opportunity to present its ideas.

EXHIBIT II-2

I.S. STRATEGIC PLANNING REQUIRES TOP-DOWN AND BOTTOM-UP INPUT



C. THE TECHNOLOGY CHOICES ARE ENORMOUS

- The ideas and concepts generated from the planning sessions with management leaves IS with the seemingly insurmountable task of selecting the best technological solutions from the ever-rising sea of choices.

- INPUT recommends that, when launching a totally new concept, an organization install a pilot system before making a commitment. The pilot should be comprehensive and evaluated in a "live" situation, but should also be reversible if proven undesirable.

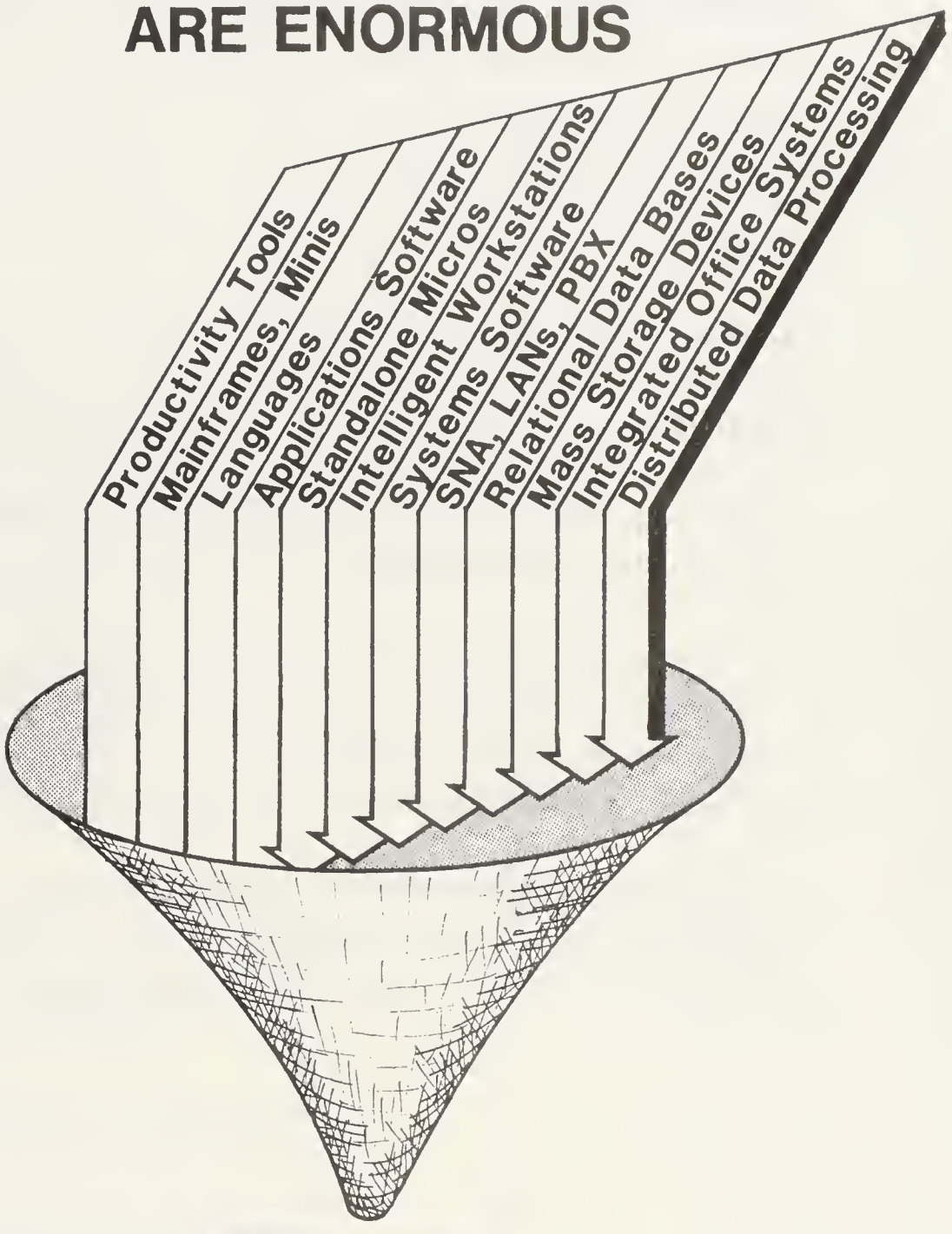
- INPUT is predicting that in the near future very large scale mainframes will be unable to provide the mips that will be required to support all of the various computer-based functions, even though it is IBM's desire to maintain central control. INPUT estimates that over 90% of the 308X's mips are devoured by IBM-generated code (systems software).

- More than ever before, alternatives to IBM should be investigated. As suggested, pilots should be installed and compared to the Big Blue solution. This is especially true in the areas of office systems, LANs, minicomputers, mass storage devices, and applications software.

- There is no doubt that in order for organizations to meet the growing demands for computer capabilities they will have to seriously consider spreading information systems resources throughout all business units using them.

EXHIBIT II-3

THE TECHNOLOGY CHOICES ARE ENORMOUS



D. THE I.S. ROLE IS CHANGING

- Recently, IS has been criticized for being reactive and unresponsive. IS was considered reactive because it would only take action if prodded by management. It was unresponsive because it supposedly stockpiled users' requests for service. In this scenario, IS found itself on the defensive, constantly fighting battles with users and upper management. IS barely had enough time to maintain existing systems, and planning was a matter of updating last year's budget.

- The advent of the information center concept and the explosion of microcomputer products has started to break down the walls of animosity, and IS is being viewed as a mentor, guide, and consultant. IS has recognized the need to control the growth of end-user computing. At the same time, though, IS must provide users with sufficient alternatives and guidelines to help users generate computer-based solutions.

- Because organizations are relying so heavily on the communications of voice and data, the responsibility for this function, along with such functions as office systems, is being assigned to IS. All aspects of data/information/knowledge systems will become the responsibility of IS.

- Information systems concepts are becoming an integral part of the unique business strategies of most organizations. Therefore, IS will begin to play a more important role in the corporate business planning process.

EXHIBIT II-4

THE I.S. ROLE IS CHANGING

I.S. FUNCTION	PAST	PRESENT	FUTURE
Respond to Requests	X	X	X
Maintain Systems	X	X	X
Systems Team Member	X	X	X
History-Based Budgeting	X	X	
End-User Support (IC)		X	X
Strategic Systems Planning Adviser		X	X
Voice/Data Communications		X	X
Office Systems		X	X
Technical Consultant to Senior Management			X
DDP Coordinator (Micros, Minis)			X
Corporatewide IS Training		X	X
Corporatewide IS Standards (OA, Communications, Micros)		X	X

E. THE I.S. ENVIRONMENT IS CHANGING

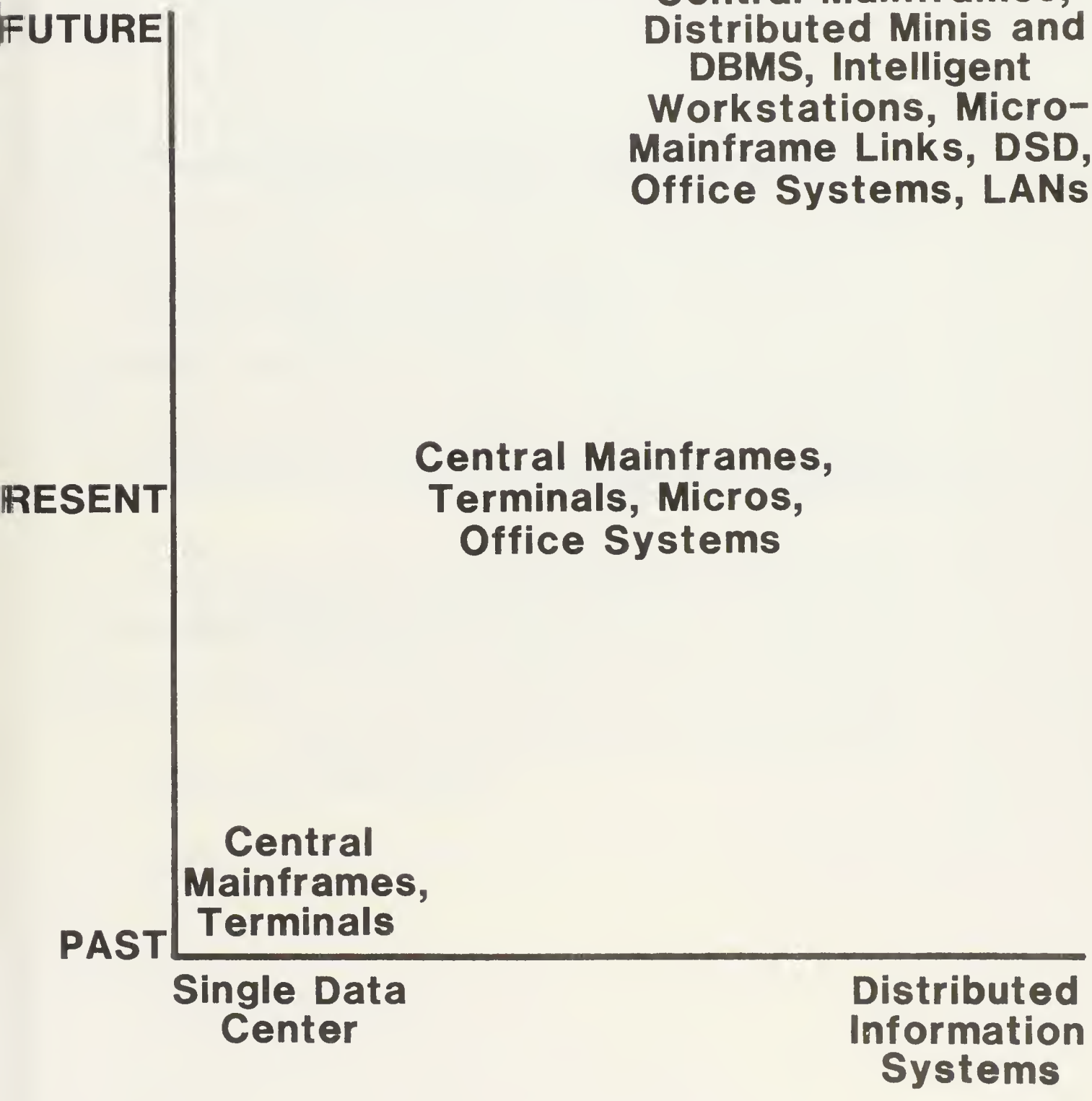
- In the past, the focal point of computing was at a central location, with a single data center that housed the mainframe computers. Terminals were scattered around an organization and connected to the mainframes by modems and telephone lines. Data representing business transactions were entered through the terminals, and end users were able to make fixed-format, predetermined inquiries into corporate data bases. This mode of computing is still prevalent but now represents only a fraction of all computing endeavors.

- There is no doubt that computing is moving toward the end user and away from the central IS core. This trend of distributing computer resources and applications software development is having a significant impact on corporate information systems planning. It was difficult enough to project the need for facilities and people in the single data center environment where all programming was done on the host by computer professionals. But now, with autonomous computer activities spreading to the end user and requiring support from IS, the planning process must include micro-based hardware and software products.

- The advent of microcomputers has changed the computing environment drastically, and unless corporate IS exercises control over the phenomenon any meaningful planning will be impossible. IS will have to identify the products that end users will need to support their computing activities, and IS will have to project the quality and quantity of staff required to support the growing end-user base.

- The emphasis will be on IS-user collaboration for the development of corporate IS plans. This will become even more apparent as the technology improves for micro-mainframe links, distributed data bases, and local area networks.

THE I.S. ENVIRONMENT IS CHANGING



F. THE FUTURE OF END-USER COMPUTING IS COMING INTO FOCUS

- By 1988 more than a quarter of the corporate IS applications will involve a combination of micros and mainframes. Even though IS has resisted the idea of using micros in a transaction-driven production environment, this is the future direction of computing. Distributed systems development (in which end users are directly involved with designing and developing computer applications utilizing techniques like prototyping) will be commonplace.

- End users have started to graduate from spreadsheet applications and now are demanding the ability to access multiple data bases maintained at the host mainframe from their microcomputers. They want an interactive micro-mainframe environment where they can perform analyses on corporate data and generate their own management reports and graphic presentations.

- This is a situation in which the demands from end users are really pushing the technological advancements. Vendors are rushing to meet the market demands, and it is up to IS to steer them down the right path based on micro-mainframe applications plans.

- Future systems development plans must consider the capabilities of the micro-based workstations. INPUT believes that offloading some of the host mainframe processing onto end users' microcomputers will become mandatory to maintain an acceptable response time and provide end users a degree of computing automony. As end users become more proficient in the use of computers, the demand for expert systems will increase.

EXHIBIT II-6

THE FUTURE OF END-USER COMPUTING IS COMING INTO FOCUS

- Distributed Systems Development
- Micro-Mainframe Links
- Modeling, Analysis, Graphics, Reporting
- Applications Prototyping
- Expert Systems

G. EXPERT SYSTEMS SHOULD BE CAREFULLY CONSIDERED

- The inference engine of an expert system is a program that can make deductions and judgments from a knowledge base of facts and rules on a particular subject. This is the concept of applying computer technology to the field of artificial intelligence (AI), which has been looked at for many years by such institutions as M.I.T., Carnegie-Mellon, and Stanford University.

- The idea of having the computer simulate the human mind in the logical thought process is very exciting and has unlimited potential for commercial application. There are, however, several factors to consider when planning for an expert system.

  - Expert knowledge is not easily codified.

  - IBM is just entering this arena with the IVANS project; standardization of knowledge bases has yet to come.

  - The few products available today in support of expert systems are very expensive (e.g., Intellicorp's KEE at $60,000).

  - Today, expert systems require experts to develop them (they have been aimed at the computer science whiz).

  - The nature of expert systems (numerous searches and comparisons) could exhaust computer capacity.

- INPUT believes that the future of the computer industry lies in the field of artificial intelligence and that the real thrust in this area won't commence until the mid-1990s, which is how long it will take to address the many outstanding issues. In the meantime, independent software vendors will offer "expert systems" for both mainframes and micros. For organizations contemplating such a package, INPUT highly recommends the pilot approach.

EXHIBIT II-7

EXPERT SYSTEMS SHOULD BE CAREFULLY CONSIDERED

- Data/Information/ Knowledge Availability
- Standardization
- Expense
- Resources
- Ease of Use
- IBM's Strategy

H. CONSIDER SIX KEY POINTS TO I.S. PLANNING

- IS must stay abreast of the competition's use of computer technology. To survive, organizations must remain on a par with their competitors in their employment of information technology.

- In order for IS to develop meaningful strategic plans, it must tap management's knowledge of the organization's goals, capabilities, and information systems needs. Ideas for competitive impact systems evolve from this input.

- When technological solutions are being evaluated, potential growth should be a main consideration along with price and performance. IS should consider whether the product will adapt easily to the IS environment down the road two, three, or five years from now. Projecting future IS environments becomes a major issue of strategic planning, especially with the prospects of distributed minis and mainframes.

- IS must position itself within the organization to be recognized by executive management as the consultant on all issues pertaining to hardware, software, and communications. This becomes increasingly important as more information services are integrated (e.g., micro-mainframe, voice/data, personal computing-office systems).

- IBM's announcement of the PC-AT and the PC Network (available in 1985), which will enable users to share disk files and to transfer data from one PC to another, is an indication that micros will become an integral part of future corporate systems design. Once the PC Network becomes a part of an SNA network, interconnection of PCs and mainframes will become commonplace.

- Technological innovations that appear to provide solutions to information systems problems, but are unproven commodities, should be approached with care. To offer a competitive edge, IS must stay in front of the pack technologically. Innovations must be considered but not blindly accepted.

EXHIBIT II-8

CONSIDER SIX KEY POINTS TO I.S. PLANNING

- Join the Technology-Directed Leaders
- Listen to Management for Competitive Ideas
- Select Products for Price, Performance and Growth
- Advise Management on All IS Issues
- Consider Integration of Micros, Minis and Mainframes
- Evaluate New Technology with Caution

III I.S.—THE COMPETITIVE EDGE

III I.S.—THE COMPETITIVE EDGE

A. IMPACT OF I.S. ON CORPORATE COMPETITIVENESS

1. CONTROL-ORIENTED VERSUS COMPETITIVE-IMPACT SYSTEMS

- Regardless of the industry being serviced by an information systems function, there will be a portion of the information resource budget allocated to administrative and control systems, such as accounting, payroll/personnel, payables, and facilities management. These types of systems help manage the day-to-day operations of an enterprise but do not have much effect on its competitive status.

- Competitive-impact systems fall into three broad categories:

  - Those systems that provide added value directly to the customers of the products or services being offered.

  - Those systems designed to reduce the cost of business operations and/or increase productivity.

  - Those systems that deliver knowledge on which to base strategic business decisions.

- Some systems, of course, will fall into more than one category, such as airline reservation systems that are customer oriented but at the same time accumulate valuable marketing statistics for management. An on-line insurance claims system would be another example of a multipurpose competitive-impact system; customer claims are handled quickly and accurately, and the system collects data for the actuaries to analyze for future rate setting.

- As a first step in planning, INPUT recommends an assessment of the existing information systems. Each system should be categorized by its primary objective:

  - Added value to customer.

  - Cost/productivity.

  - Knowledge.

  - Administration/control.

- Once a system's primary objective has been identified, it should be rated against similar information systems being used by competitive organizations. This may not be a simple task, but at least the major features of the system should be compared to the competition's systems. What is being determined by this rating process is how well the enterprise is keeping up with its competition. In other words, is the system above, below, or equal to the similar systems in the industry?

- Most companies are willing to share information about the architecture of their key competitive systems. In fact, many of them are eager to show off their leading-edge systems and will conduct tours of their facilities. A good place to start looking for the leaders is through IBM's application briefs, which outline actual information systems of IBM's customers.

- Exhibit III-1 contains an example of a system's competitive assessment form. The priority codes help to identify the effectiveness of the system in supporting the business goals of the enterprises.

2. EMERGING I.S. STRATEGIC OBJECTIVES

- Cost/benefit analysis has been the traditional approach used to justify an information systems project. Normally, the key line managers, advocating the new system, work with the IS development staff and accountants from finance to generate the return-on-investment figures to be presented to a steering committee or project review board comprised of senior executives. If the tangible (dollar) savings are significant and the breakeven point is not too far in the future, the project is approved. In this scenario, intangible benefits such as decision support information are used as supportive backup material but are not likely to be the determining factors.

- Unfortunately, the strict adherence to the rule that hard-dollar savings must be evident before a project can obtain approval has eliminated many competitive advantage systems. Even a system that helps a company get a superior product to the marketplace ahead of the competition may not get approval from the steering committee if it cannot be shown that operating costs will be cut.

- If a company is at the extreme ends of either a growth cycle or a business decline cycle, it should seriously consider ways to employ computer technology to aid it during these difficult times. In a growth situation the computer can be used to reduce production time and design time and to help control the quality of the product. Demographic market studies can be aided by information technology. If profits are shrinking and customers are turning to the competition, explore changes that are needed to reverse this trend. Then evaluate the role computer technology could play in implementing these changes. In either of these extreme cases time is the critical factor.

EXHIBIT III-1

SYSTEMS COMPETITIVE ASSESSMENT

SYSTEM DESCRIPTION	OBJECTIVE		RATING	PRIORITY	COMMENTS
	Primary	Secondary			

Key:

OBJECTIVE:

1 = Added Value to Customer
2 = Cost/Productivity
3 = Knowledge
4 = Administrative/Control

RATING:

1 = Above Competition
2 = On Par
3 = Below Competition

PRIORITY:

1 = Crucial
2 = Necessary
3 = Important
4 = Expendable

- Organizations have started viewing the IS resources as strategic tools to be used to gain a competitive advantage and/or to become the leader within a particular industry. Being a leader requires knowledge of what others are doing with information technology, and not just what is being spent on information technology. It is folly to establish the IS budget as a percentage of revenue based on industry averages.

B. STRATEGIC SYSTEMS FOR CORPORATE SURVIVAL

1. FOLLOW THE INFORMATION SYSTEMS LEADERS

- Each industry seems to have companies that are well ahead of the rest in integrating strategic business plans and information systems plans. There are information system innovators in banking, transportation, insurance, wholesale distribution, and manufacturing.

- There are risks involved with being the leader in innovative computer-based systems, but the risks of lagging behind the industry can be even more devastating. Imagine a savings and loan association without on-line terminals to process customer transactions, or a large retail department store without a point-of-sale data collection system, or a car rental agency without a reservation system. Wizard of Avis and Sabre of American Airlines were pioneers of the reservation systems, but each of those companies could envision the payoff in increased sales and market share by being the first to integrate computer technology into the business strategy.

- To survive, corporations must recognize the industry leaders that are willing to invest in competitive information services opportunities. The corporations must make the commitment to at least build systems that will provide competitive parity. This is especially important in an industry in which there are many entrants vying for potential business.

- In developing information systems plans, quantified resources should be allocated to the following levels of systems activities:

  - Maintaining existing systems with modifications necessary to meet business changes.

  - Introducing systems technologies and methods aimed at staying abreast of the competition.

  - Introducing systems technologies and methods aimed at attaining a competitive advantage.

  - Implementing systems aimed at improving productivity.

- IS has the responsibility of keeping executive management apprised of the competition's information systems activity along with assessing the competitive impact of such activity. This is essential information on which to base IS budget decisions. Executive management must understand the organization's competitive weaknesses relative to the employment of computer technology to support business strategies.

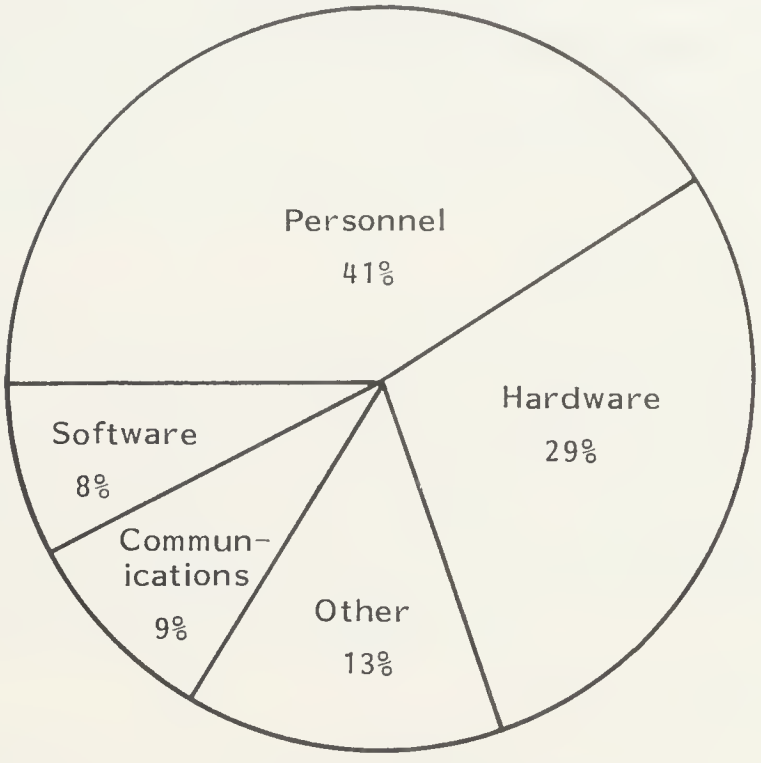
- Exhibit III-2 shows two pie charts: one is a breakdown of the total IS resources with percentages representing cross-industry averages, and the other is a breakdown of systems development opportunities. The allocation of IS resources for systems opportunities will, of course, vary considerably by industry and by company within an industry.

2. THINK COMPETITIVE SYSTEMS

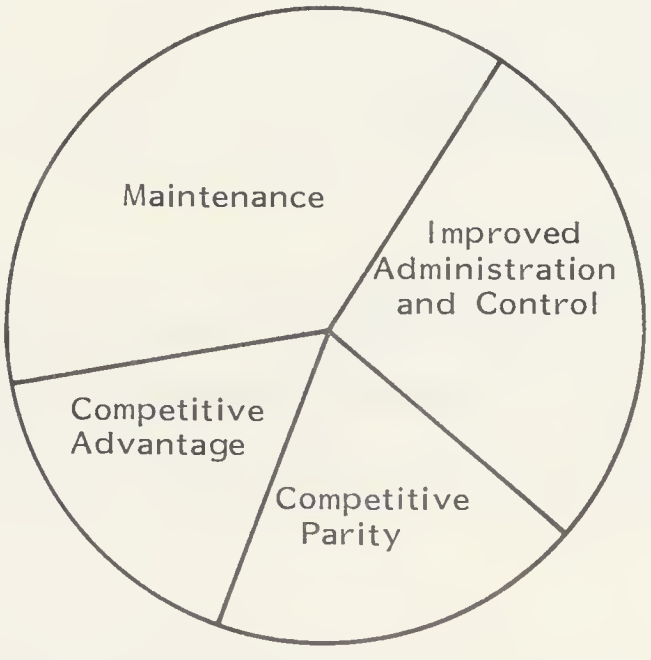
- Proposals for systems development should clearly indicate the competitive impact of the project, the competition's status in the area, and the potential risks of not proceeding. This holds true regardless of the origin of the project;

EXHIBIT III-2

SLICING THE I.S. RESOURCE PIE
FOR SYSTEMS DEVELOPMENT



IS Total Resources Expenditures



IS Development Expenditure Opportunities

it could be a proposal for a worldwide communications network or the acquisition of some computer-aided design (CAD) equipment.

- During the IS planning process, executive managers should be asked to provide their thoughts on the strengths and weaknesses of the various business functions of the enterprise. IS should know which functions they believe require improvements in order for the organization to move ahead in its industry. Executive management should agree on the relative importance of the areas identified as strategic weaknesses. Weaknesses could be uncovered in any of the following functional areas:

  - Customer service.
  - Quality control.
  - Production scheduling.
  - Market forecasting.
  - Inventory levels.
  - Sales/marketing methods.
  - Research and development.
  - Staffing and recruiting.
  - Accounting.

- Once senior management begins to realize the potential competitive advantage that can be achieved through the use of computer technology, systems proposals will be viewed in a different light. All management ranks should be encouraged to consider the competitiveness of computer-based systems activ-

ities. Creative ideas will emerge from a conscious awareness of the competitive impact of a systems change.

3. INTEGRATING I.S. WITH BUSINESS STRATEGIES

- In some organizations strategic business planning is a staff function reporting to an administrative executive that supports the chief executive officer. In these arrangements it is rare for the business planners to give more than a passing thought to IS's role in offering any significant competitive advantage. Such companies primarily seek new products for existing markets or new markets for existing products.

- Where strategic business planning is remote from IS and the rest of the organization, IS usually spends its planning energies on initiatives related to improving IS's ability to furnish information resources--capacity planning, systems software planning, productivity tools planning, end-user computing planning, and so forth--to the organization. These are important issues and will be discussed in later chapters of this report; however, resource planning should follow systems development planning.

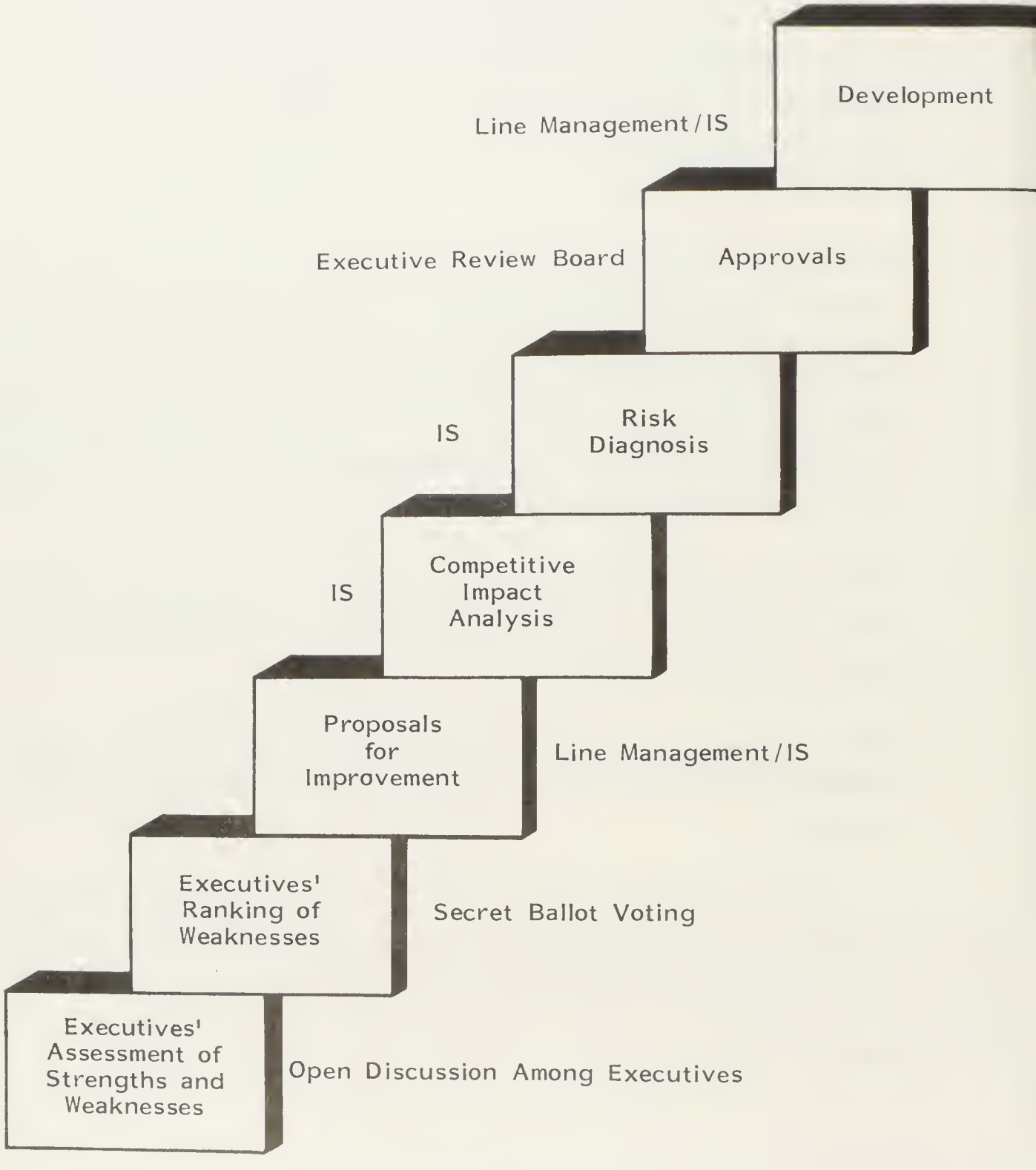
- Other enterprises set aside several days a year during which senior management, including the IS management, assembles at an isolated location to discuss business strategies.

- INPUT believes the ladder approach bears the most planning fruit. Exhibit III-3 depicts the process that can be followed to accomplish effective systems planning.

  - The first step is an open discussion among the executives representing the various major functions of the enterprise. During this step deficiencies within the business are identified.

EXHIBIT III-3

STEPS TO EFFECTIVE SYSTEMS PLANNING



- The next step is the ranking of the deficiencies in order of their importance to the achievement of corporate goals and objectives. INPUT suggests a secret ballot vote for the ranking to remove any political influence.

- This ranking of the organization's deficiencies by executive management gives direction to IS and to the operational line management for proposed information systems ideas and concepts.

- IS can evaluate the ideas and concepts against competitive systems that are up and running to ascertain the business value of a proposed approach.

- IS can also diagnose the risks involved in implementing innovative systems and the risks involved by maintaining the status quo.

- At this point, the project review board or IS steering committee should be able to make an informed decision about the merits of approving the resource expenditure for the proposed systems development.

C. IMPACT OF TECHNOLOGY ON PLANNING

1. IMPROVING PRICE-PERFORMANCE RATIOS

- Even though large central mainframes are hovering around the 30 MIPS performance level and IBM recently reduced the prices for its 308X line, serious consideration should be given to increased distribution of computer power. INPUT predicts that the demand for computational capabilities to support the ever-increasing end-user decision-making applications may exceed the increases anticipated in processor performance for very large scale mainframes.

- Competitive-impact systems tend to move computer capabilities closer to end users and tend to increase the demand for data base support and communications support. The price-performance advantages of off-loading some of the mainframe work to minicomputers and microprocessors should be investigated. INPUT envisions large mainframes as becoming enormous data base machines and communications hubs, with intelligent workstations and superminis (e.g., HP 3000, DEC VAX 11/750, and WANG VS) performing much of the data processing functions.

2. ADVANCES IN WORKSTATION TECHNOLOGY

- As more of the information systems requirements of an enterprise are satisfied by dispersing computer resources to the various business units, the workstation terminal will become increasingly sophisticated.

- Ultimately, the capabilities of the personal computer must be incorporated in terminal devices that can communicate over links to mainframes or other terminals. This implies that individual workstations should be able to perform standalone applications as well as to interact with host computers as data collection devices or to query the corporate data bases. The workstation should also be able to communicate with other workstations to handle office systems transactions. IBM and ROLM are about to market a voice/data workstation that combines telephone and computer capabilities.

- There are predictions that the market for intelligent terminals will be in the neighborhood of $20 billion within the next three years and that the number installed will double to over four million.

- The state of micro-mainframe products has caused planners to be reluctant about considering multiple uses for workstations. The interest in intelligent terminal capabilities is so high, however, that INPUT believes that announcements of new products in this area will increase accordingly. Conceptual

planning, therefore, should take into consideration rapid advancements in micro-mainframe links and LANs (Local Area Networks) from a number of the leading vendors. Computerized information processing is headed toward the office, and micro-mainframe links are a major step in this movement.

- For more information on issues related to micro-mainframe links, refer to the INPUT reports, End-User Micro-Mainframe Needs, July 1984, and Micro-Mainframe: Telecommunications, October 1984.

3. FUTURE OF COMMUNICATIONS

- INPUT's surveys have revealed that the vast majority of the Fortune 1000 companies are giving the responsibility for all communication services to the IS manager. This makes a lot of sense in light of the increasing dependence on computer technology at the office worker level.

- End-user computing demands and the anticipated growth in this area have triggered a revolution toward digital voice/data phone systems. Because more and more sections of a company communicate through the transmission of data, it is advantageous to consider digital telephone transmission systems that accommodate voice and data simultaneously. The competition in this service area is growing and includes AT&T, Northern Telecom, ROLM, and NEC (Nippon Electric Corp.). NEC is introducing the NEAX 2400 Information Management System, which processes data at 9,600 baud and implements a local area network through multifunction phones. The heart of this system is a microcomputer with two M-bytes of RAM that stores messages in digital form.

- IBM's acquisition of ROLM is a further indication that information systems are becoming an integral part of the day-to-day tasks of the nation's work force. ROLM is a leader in computer-controlled telephone systems (PABXs or private automatic branch exchanges). IBM recognizes that PABXs are a vital component in tomorrow's world of computerized office communications.

- There are many alternatives to the tasks of communicating data from one location to another, and these should be investigated by the IS communications planners. Reliability, efficiency, and cost should be compared for:

  - Broadband coaxial-cable-based television systems.
  - Satellite systems.
  - Microwave systems.
  - Fiber-optic cable laser systems.
  - Digital termination systems.
  - Cellular mobile radio.

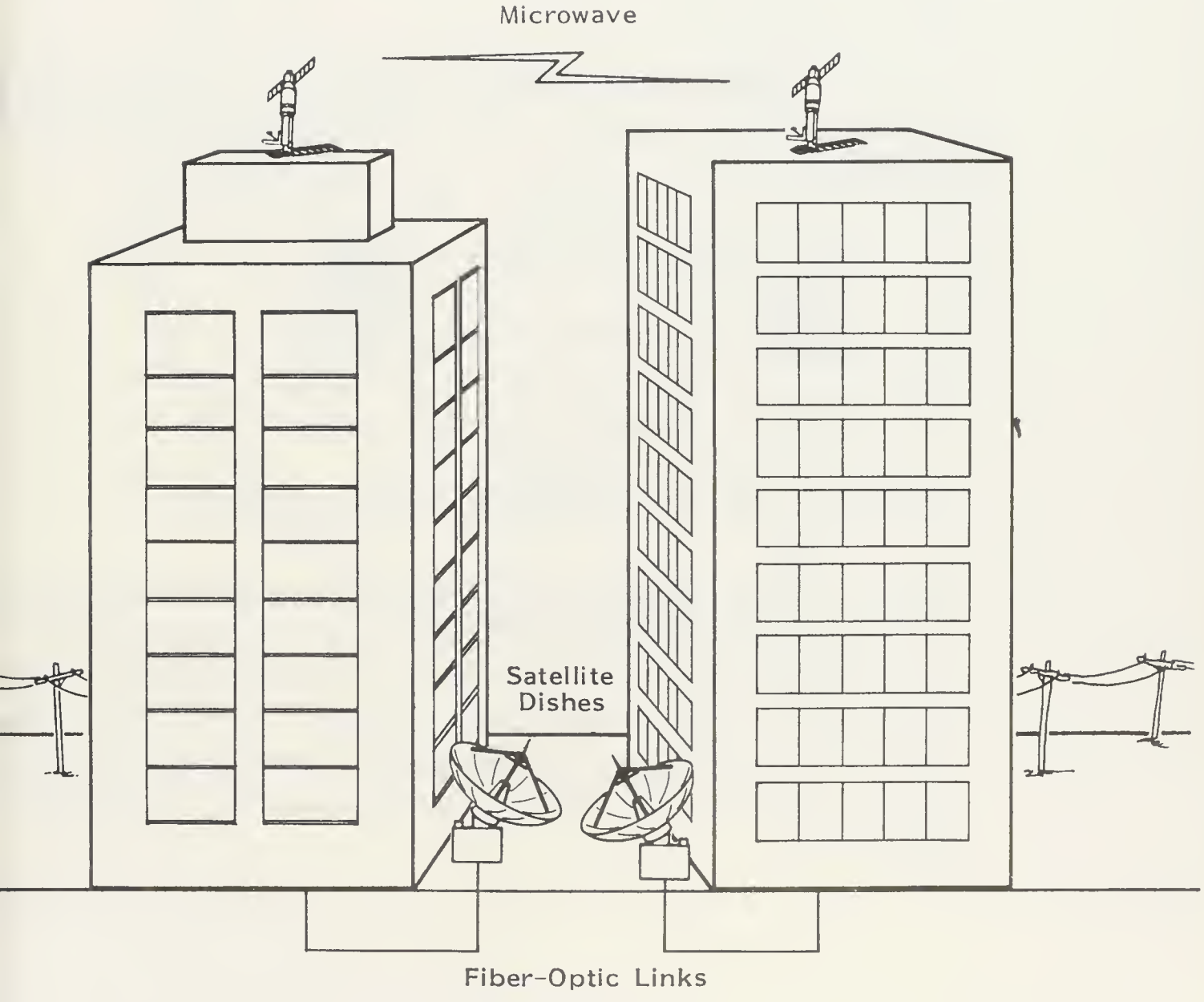
- Fiber-optic links are being used to transmit voice and data communications to satellite dishes. From these teleports the voice and data communications are transmitted via satellite to another teleport. This mode of communication will grow as costs for local phone lines increase and the communications requirements increase. For years big companies have been employing microwave radio signals for communications between remote locations. These modes of communication are depicted in Exhibit III-4.

- The broadband coaxial-cable-based television systems provide the link for teleconferencing, videotex, and local data communications. These cable networks have limited voice communications capabilities but can be used to transport digital signals to a teleport.

- Future building construction designs will certainly include telecommunication services as regularly as electrical wiring is included today. InteCom's Integrated Business Exchange (IBX) systems provide shared telecommunications

EXHIBIT III-4

VOICE/DATA TRANSMISSION MODES



services to tenants of a building. The system's two-pair cable plant accommodates voice, data switching, format and protocol conversion, high-speed synchronous and asynchronous circuit-switched transmission, and local area networking. Exhibit III-5 illustrates the various communications requirements handled by the IBX system.

4. EXPANDING SOFTWARE MARKETS

- Software products growth has exploded in recent years, with the market's revenues climbing to $7.5 billion in 1983. In the 1984 ADAPSO report, INPUT indicated an average annual growth rate of 39% for software products between 1982 and 1983.

- For calendar year 1983 INPUT ranked the top independent software companies by revenues. The 50 companies in the ranking were divided into three market segments:

  - Systems software (15 companies).

  - Microcomputer software (nine companies).

  - Applications software (26 companies).

- Exhibit III-6 lists the top five companies in each market segment.

- Packaged software is the key to future applications of computer technology. The ever-increasing cost of labor to build software is forcing companies to buy ready-made software packages. There are industry-specific packages, such as PMS for property and liability insurance companies (from Policy Management Systems Corporation); and there are general business packages, such as the general ledger accounting package (from Management Science America, Inc.).

EXHIBIT III-5

TENANT TELECOMMUNICATIONS SERVICES

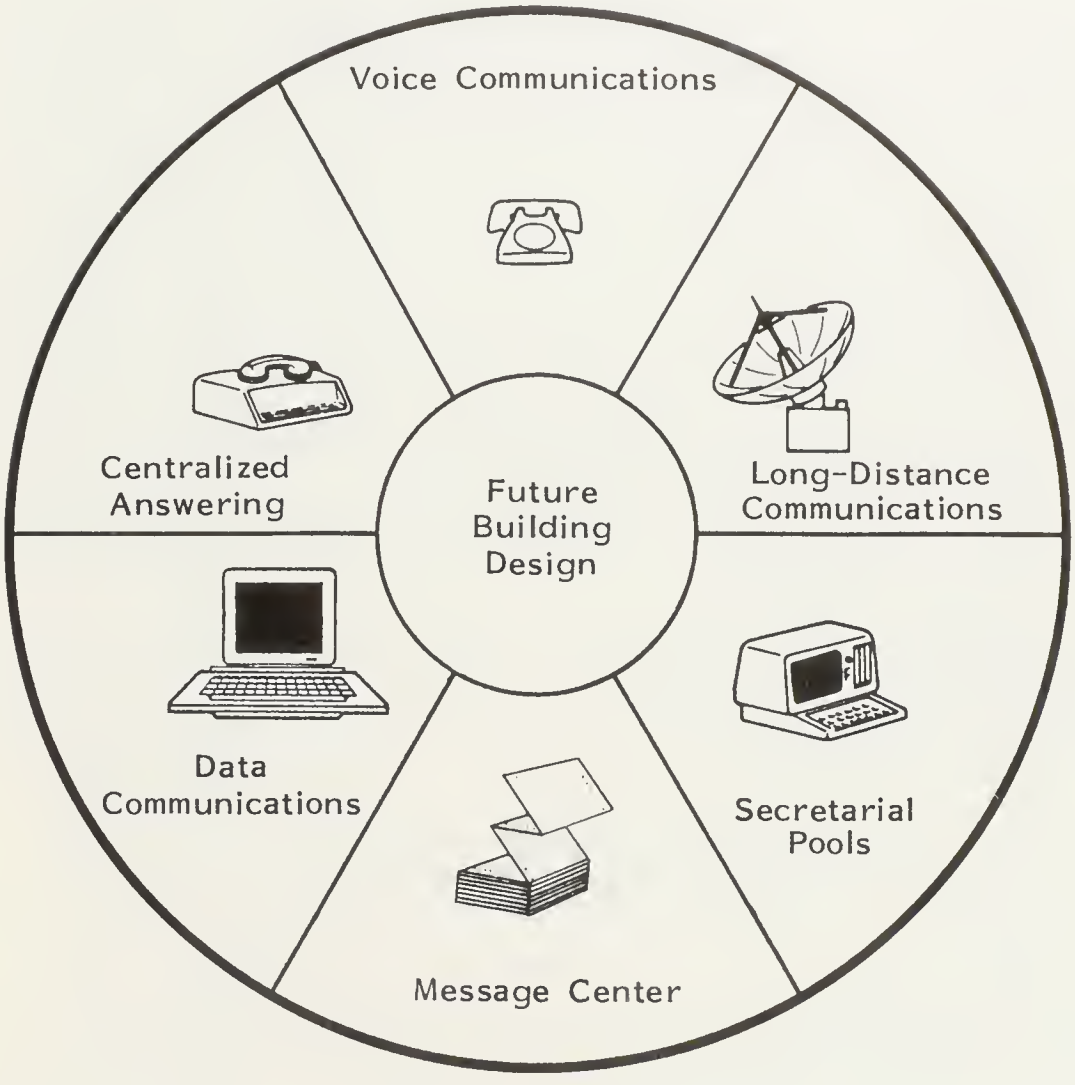


EXHIBIT III-6

LEADING INDEPENDENT SOFTWARE COMPANIES
(Revenue Ranking for Calendar Year 1983)

COMPANY	REVENUE
SYSTEMS SOFTWARE	
Cullinet Software, Inc	$92,000 *
Applied Data Research	57,000
UCCEL Corporation	56,000
Cincom Systems, Inc.	35,000
Computer Associates Intl. Inc.	35,000
MICROCOMPUTER SOFTWARE	
Lotus Development	$53,000
Microsoft Corporation	51,000
MicroPro International	46,000
Digital Research, Inc.	46,000
VISI Corporation	40,000
APPLICATIONS SOFTWARE	
MSA	$109,000
Informatics General	79,000
McCormack & Dodge	50,000
Charles Mann and Associates	47,000
Evaluation Planning Systems	38,000

* Numbers Rounded to the Nearest Thousand

- Of course, the microcomputer mania has introduced a rash of products designed for end-user consumption, such as the very popular 1-2-3 product from Lotus Development Corporation, which provides an integrated spreadsheet analysis, data base management, and a graphics package for IBM personal computers.

- IBM has never competed too vigorously for a share of the applications software market and has concentrated on systems software. INPUT's report Information System Implications of IBM Software Strategies (1984) points out that as more and more intelligent workstations and remote processors are supported by the host mainframes, IS will be forced to consider IBM's MVS/XA (Multiple Virtual Storage/Extended Architecture) operating system to take advantage of the 31-bit addressing mode that extends virtual storage, extends real storage, and increases the I/O capabilities of the dynamic channel subsystem. IBM's strategy is to maintain central control of networks and data bases through large mainframes with operating systems such as VM/CMS (Virtual Machine/Conversational Monitor System) and MVS/XA.

- IBM's announcement of the 3270 PC and XT/370 under CMS are indications of IBM's strategy to maintain control of the trend toward distributed data processing.

5. ADVANCES IN DATA STORAGE AND RETRIEVAL

- Considering the increasing requirements for computer storage, it's becoming a race to see if the technology can keep pace with the need and desire to store and access data. The use of micro-based workstations linked to the mainframe is rapidly moving upward through most organizations. During the 1970s it was a fairly easy task to predict storage requirements, because the data collection and information retrieval was performed at the clerical level through applications software designed and developed by central IS. Today, the end-user community includes first-level and middle managers performing ad hoc decision support computations that require interfaces with multiple

data bases. Forecasting the growth of end-user demands for storage is perplexing because it cannot be based on historical data and is not easily controlled by IS. Some IS managers have taken the approach of maintaining a 20% or 30% storage margin over the worst-case maximum requirements.

- For high-capacity, high-performance storage, the IBM 3380--with its 2,500 M-bytes capacity--is the standard against which the plug-compatible counterparts are measured. Amdahl, CDC, Memorex, NAS, and STC all market 3380-plug-compatible disk drives, and these should be evaluated during storage planning.

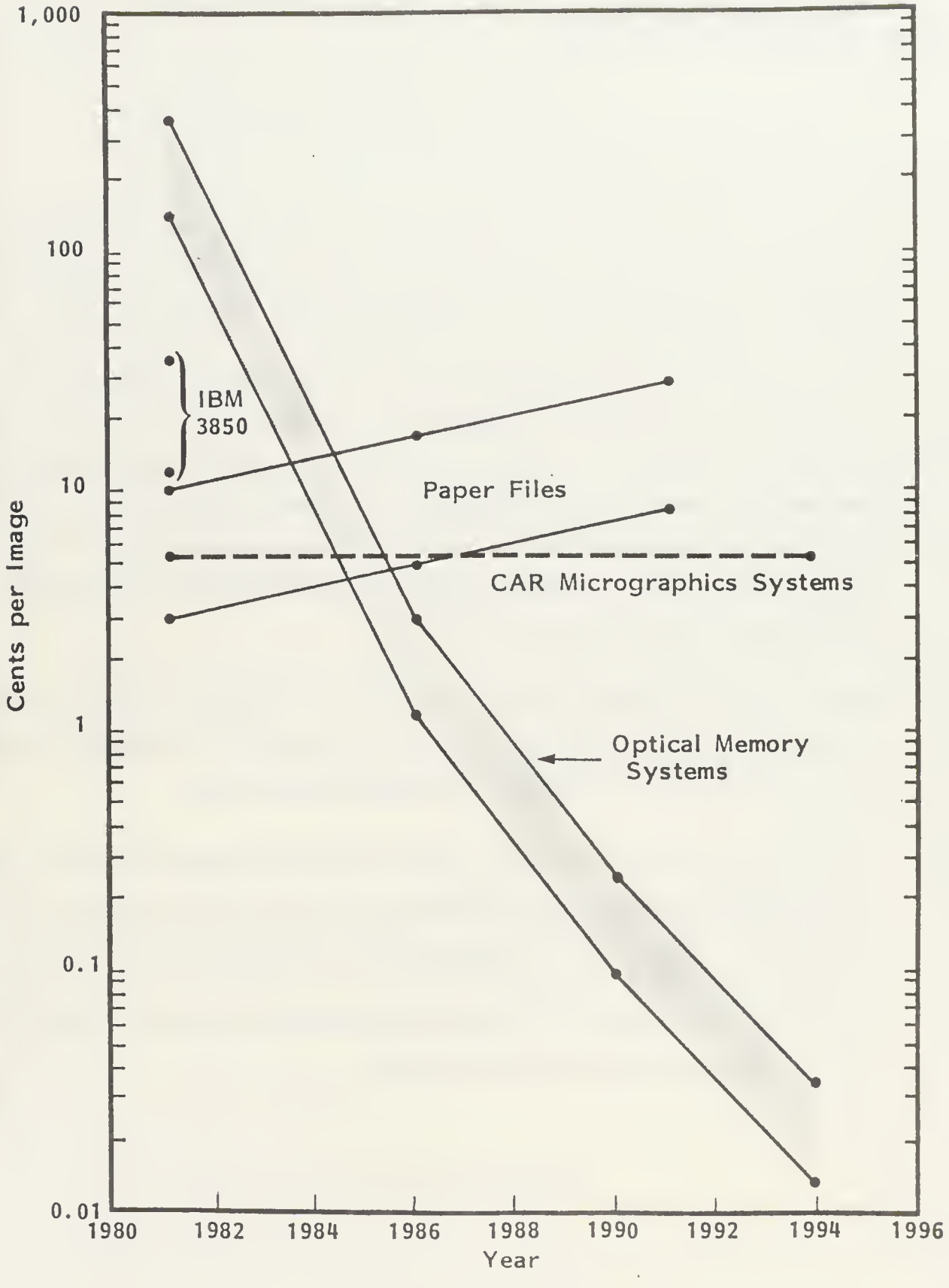
- IBM recently announced new high-performance models of the 3880 storage control unit with 8, 16, or 32 megabytes of cache memory and operating speeds of up to three megabytes per second. This announcement coupled with the price reductions of the 3380/3880 adds credence to the long-rumored higher-density 3380 disk drives.

- In April 1983 INPUT published a report entitled Impact of Upcoming Optical Memory Systems. In that report, INPUT recommended that IS management stay abreast of the optical storage technology because of its potential effect on the future record-keeping functions of the nation. A single optical disk platter, for instance, has enough storage to hold the Encyclopaedia Britannica, including illustrations. Exhibit III-7 illustrates that optical memory systems are the real hope for achieving paperless office systems. Integrated Image Processing Systems are ideal for office automation because they have the ability to mix encoded data from data bases with documents and images. IBM is expected to compete in these markets in the 1986-1987 time frame.

- In the microcomputer arena, look for advancements in removable Winchester hard-disk cartridges to provide greater capacity and reliability over floppies and fixed varieties. A 5.25-inch disk can store up to a maximum of 20 megabytes, and some of the newer drives require less space than a floppy drive. One word of caution: software designed for use on floppy disks may not

EXHIBIT III-7

PROJECTED COSTS OF IMAGE STORAGE SYSTEMS



function in the hard-disk environment because of copy protection. Check with the software vendors.

D. CHANGING ROLE OF I.S.

1. SYSTEMS STRATEGY ADVISOR TO EXECUTIVE MANAGEMENT

- There are companies today that have the responsibility for voice communications and office systems (systems, procedures, or methods) reporting not to IS, but to a group called Corporate Services or Administrative Services. These same companies will normally have IS reporting to the financial officer and will view IS as a data processing service function and nothing more. In this environment IS reacts to requests for new, or modifications to, information systems based on the information resource knowledge of line management. Information technology is viewed not as a means of achieving a strategic business advantage, but as a way of acquiring more operational control. IS is reluctant to initiate innovative systems strategies for fear of disrupting the status quo and the potential risk of failure.

- The advances in telecommunications, end-user computing, and office systems make it imperative that these functions be planned and managed by a senior manager reporting near the top of the organization.

- Executive management must be made aware of the potential strategic advantages offered from innovative information systems so that managers will seek advice from IS on how to improve the corporation's competitive position through information technology. IS must be prepared to provide strategic advice by understanding the capabilities and limitations of the relevant hardware, software, and communications tools.

- There are several ways to get executive management's attention on the subject of innovative information systems. IS might:

  - Conduct executive briefings on computer technology.

  - Have vendors arrange meetings between executives and their peers in leading-edge companies.

  - Invite management consultants to identify competitive systems opportunities.

  - Forward articles on competitive-impact systems to executives.

2. INFORMATION RESOURCE CONSULTANT

- There was a time (and still is in many places) when such items as telephone systems and office equipment were initiated by a variety of line managers and the acquisition approval for these expenditures followed a variety of organizational paths. Personal computers started up this same route.

- IS must assume the responsibility for reviewing and sanctioning purchase requisitions related to information technology items. This will assure:

  - Compatibility for future connectivity.

  - Cost-effectiveness.

  - Uniformity for planned integration.

  - Growth potential.

  - Vendor viability.

  - Product performance and reliability.

- Exhibit III-8 illustrates the areas of information services that should be coordinated through a central IS function. Putting this into practice will depend on IS's status in the organization. IS may very well be in the approval loop for most of the items listed, but some may still be viewed as the responsibility of line management. In these situations IS must convince senior management of the advantages (as listed in the above paragraph) of having IS cognizant of these activities.

3. INFORMATION COMMUNICATIONS SPECIALIST

- Because of the increasing demands to transmit data brought about by office systems and end-user computing, enterprises are looking to IS to solve the voice/data communications problems.

- This growing need for "intelligent" buildings that are wired for digital telephone transmission systems and have teleports for satellite transmission requires the expertise of an IS telecommunication professional.

- The key to gaining a competitive edge may very well lie in the ability of a corporation to reduce the time required to communicate ideas, decisions, and activities through a network.

E. DATA—STILL THE KEY INGREDIENT

1. COMMUNICATING, REPLICATING, PROJECTING

- One of the main problems of past management information systems was the designer's assumption that the elements of data needed to build decision support systems were going to be magically maintained by the computers. To build models of actual company activities requires collecting and storing data that represent the actions taking place at the lowest levels within the organi-

EXHIBIT III-8

ITEMS REQUIRING I.S. APPROVAL

- Computer Mainframe and Associated Systems Software
- Mainframe Peripheral Equipment
- Applications Software
- Terminals
- Personal Computers
- Personal Computer Software
- Office Automation Equipment
- Data Communications Equipment
- Voice Communications Equipment
- Time-Sharing Services

zation (the clerk entering telephone orders; the supervisor entering production activity, inventory dispersements, engineering changes; tellers; accountants; underwriters; and so on).

- Don't fall into the trap of leading end users to believe that all the data they need to replicate the organization's business activities are accessible through their personal computer keyboards. The objectives of a particular end user and the limitations of the corporate data bases are extremely important factors for end-user consultants to consider. Exhibit III-9 illustrates the types of demands that will be made on the corporate data bases.

- INPUT is projecting the growth of micro-mainframe applications in a range from 20% to 35% by 1988. This means there will be a tremendous demand for corporate data from first-level and middle management. The major issue will not be solving the technical problems of shared functionality between host and micro. Rather, the major issue during the next few years will be whether to provide end users with the appropriate data on which to develop decision support systems.

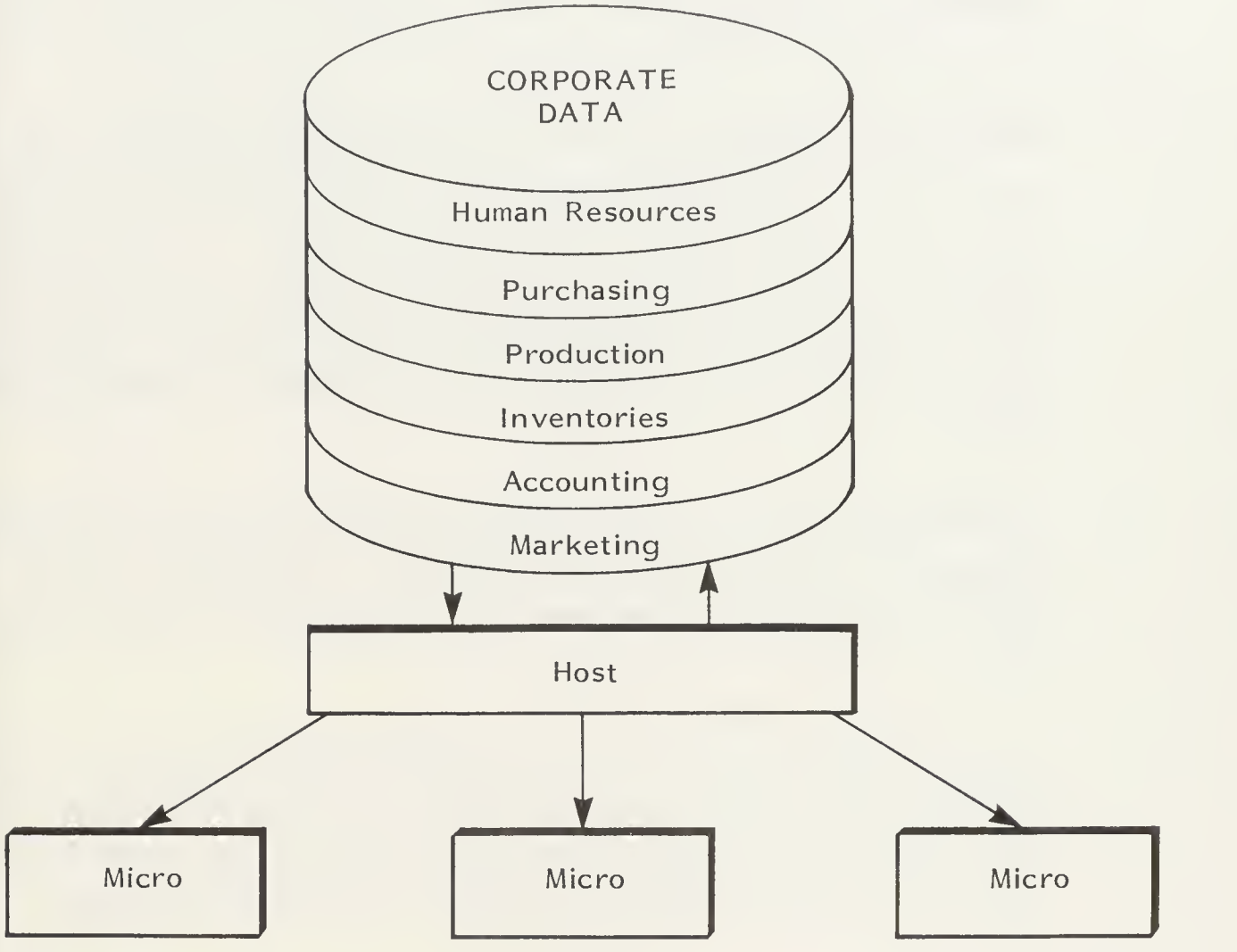
- Because data are the key ingredients to building decision support systems, it is imperative that IS furnish the data base expertise for selecting mini and micro data base software that is compatible with the mainframe data base management systems. Data administrators and chief information officers will become extremely important to IS.

2. ARTIFICIAL INTELLIGENCE AND THE FUTURE

- Institutions such as Stanford University, M.I.T. and Carnegie-Mellon University have been conducting research in the field of artificial intelligence (AI) for many years. From this research, companies (e.g., Digital Equipment Corporation) have been developing AI concepts for commercial use, and the products are called "expert systems." Two components comprise an expert system: a knowledge base of rules and facts about a particular topic and an

EXHIBIT III-9

DEMANDS ON THE CORPORATE DATA BASE



- Sales Forecasts
- Production Forecasts

- Cost Control
- Production Analysis

- Market Analysis
- Business Strategies

inference engine (a program that interprets the information to make deductions and judgments).

- Expert systems are in limited use today because expert knowledge in many disciplines is not easily codified and the supporting software is quite expensive. (For example, the Knowledge Engineering Environment (KEE) version 2.0 from Intellicorp is priced at $60,000.) The expert systems market is expected to exceed $2 billion by 1990, which means that prices will drop and applications will increase.

- Another factor governing the growth of expert systems is the need for experts to develop them. Inference Corp. is in the process of developing a package--called Automated Reasoning Tool--for DEC's VAX-11. It will be used by programmers to create expert systems applications and will run under VMS. Most of the AI products developed for DEC are written in LISP and are run under UNIX or VMS, which means they are intended for programming specialists.

- Teknowledge Inc. of Palo Alto (CA) has an expert systems development package called M.I. that is priced at $12,500. This system is directed at people with programming experience but no experience in artificial intelligence.

- Expert Software International Ltd. of Scotland has sold 30 packages of their EXPERT-EASE product in the United States. Customers of EXPERT-EASE can develop expert systems on their microcomputers (such as the IBM PC) without any previous programming experience. The price is only $2,000.

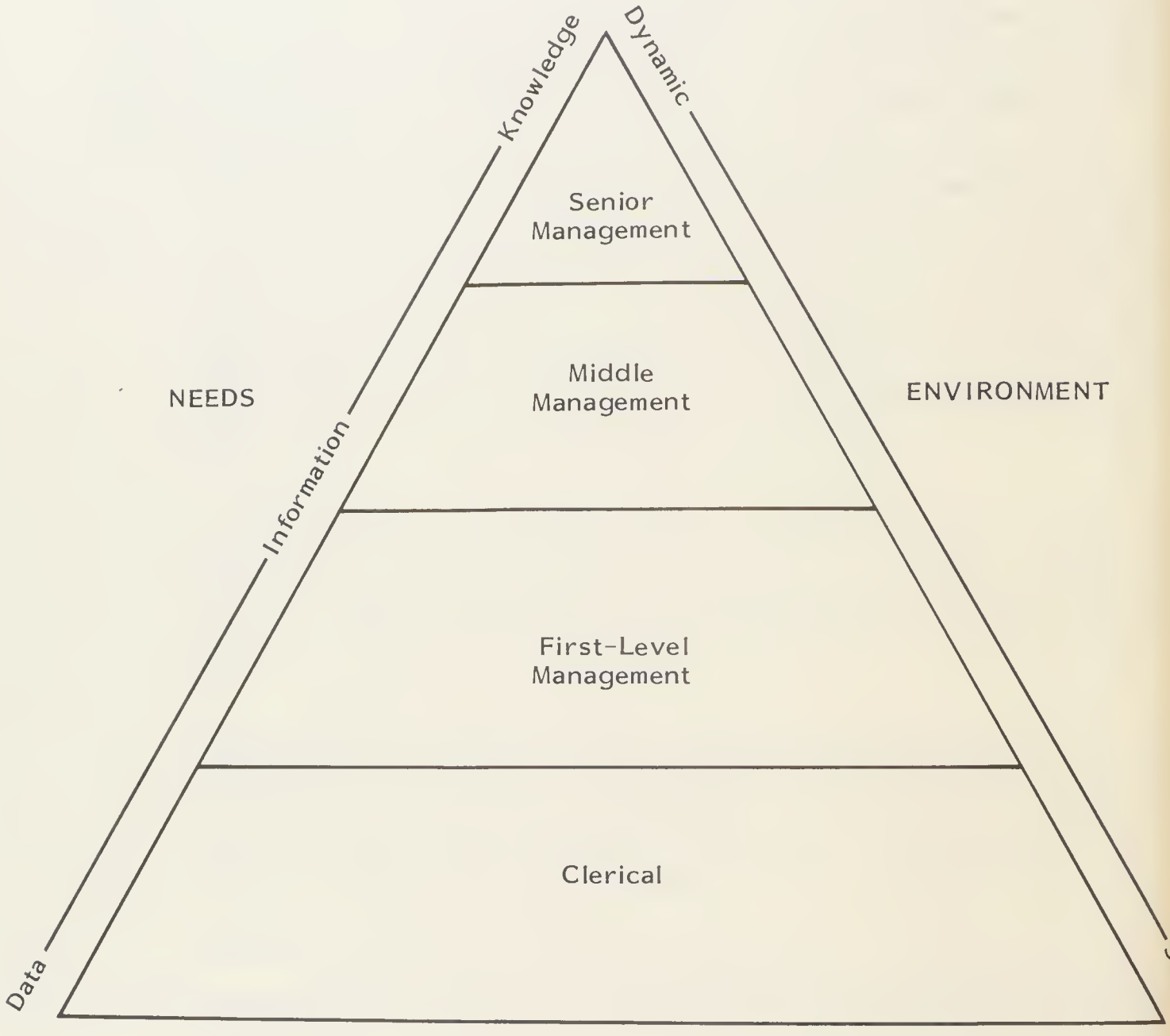
- There is definitely a move from data to information to knowledge, and today's data bases will be tomorrow's knowledge bases. Fifth-generation technology will be aimed at the business professional and will have increased use of natural languages to provide the necessary user-machine interfaces. Japan has been working on the development of a fifth-generation computer designed

around artificial intelligence concepts and has produced a processor called the sequential inference machine (SIM), which adopts logic programming.

- As depicted in Exhibit III-10, future competitive impact systems will provide senior management with expert systems knowledge on which to base strategic business plans. At the lower ranks of an organization the workers process transactions within a unique area of the business. As the responsibilities increase, the environment becomes less predictable and there is a greater need for information to manage and control business operations. At the top of the ladder, leaders need to view the entire enterprise and require knowledge of the business's strengths and weaknesses relative to the competition.

EXHIBIT III-10

COMPETITIVENESS REQUIRES KNOWLEDGE



IV ENVIRONMENTAL STRATEGIES

IV ENVIRONMENTAL STRATEGIES

A. IMPACT OF END-USER COMPUTING

1. DEFINITION OF END-USER COMPUTING

- Any employee of an organization, from clerk to chief executive officer, who directly interfaces with stored-program computer technology in the course of fulfilling his or her duties is considered an end user. Exempt from this group, of course, would be professional programmers.

- End-user computing can involve a variety of resources:

  - Standalone microcomputers with their unique software packages, storage devices, and output devices.

  - Micro-mainframe linkages in which processing power and data are shared by host mainframes and microcomputers.

  - 3270-type terminal devices having access to mainframes with their programming and data storage capabilities (an information center concept).

  - Terminals used to develop programs for end users through in-house timesharing systems (TSO).

- Clustered workstations connected to minicomputers or mainframes for office systems, such as:

  . Data General's Comprehensive Electronic Office System.

  . DEC's ALL-IN-1.

  . Wang's Office.

  . IBM's PROFS.

- Exhibit IV-1 provides examples of typical end-user computing applications in such functional areas as marketing, finance, and personnel. There are five main categories of information processing associated with end-user computing:

  - Document processing.

  - Numerical analysis.

  - Information retrieval/manipulation.

  - Communications (correspondence).

  - Graphic representation.

2. CONSIDERATIONS FOR I.S. PLANNING

- Senior management has become concerned with the potential expense of the increasing interest in end-user computing products, and of microcomputers in particular. It is now looking to IS as the corporate computing organization to control and manage this phenomenon.

EXHIBIT IV-1

END-USER COMPUTING CATEGORIES

CATEGORY	END-USER COMPUTING EXAMPLES
Document Processing	Marketing - Activity Reports, Product Literature Finance - Financial Reports and Plans Personnel - Management Reports and Plans
Numerical Analysis	Marketing - Profit and Loss per Product/ Market Finance - Modeling, Statistical Analysis Personnel - Salary Analysis, Statistical Reports
Information Retrieval/ Manipulation	Marketing - Customer and Sales Force Data Finance - External Economic Services Personnel - Personnel Files, Applicant Files, Skills
Communications	Marketing - Product Literature, Correspondence Finance - Subsidiary Communications, Memos Personnel - Applicant Letters
Graphics	Marketing - Customer Presentation Finance - Historical Trends, Comparisons Personnel - Organization Charts, Presentations

- IS must assume the leadership position in future applications of end-user computing products. Consulting/liaison, training, and programming assistance are the areas of support that are imperative for IS to furnish to the end-user community.

- To offer shared functionality and ultimate flexibility to end users, future corporate systems development activities should consider the benefits of incorporating intelligent workstations in the design.

- Exhibit IV-2 illustrates how end-user computing is spreading through organizations and will directly involve the senior executives within ten years. This explosion in the concept of putting computer power directly in the hands of the work force is changing the relationship of data and information to knowledge. As end-user computing gets closer to the top of an organization, the need for knowledge bases increases. This need will start with a need desire to access multiple data bases and will continue as a demand for expert systems. This knowledge base for strategic business planning will not be available through computer technology without involvement from IS.

3. THE FUTURE OF END-USER COMPUTING

- When a variety of IS organizations were asked their opinions on the main benefits of end-user computing, the responses fell into two categories: what end-user computing was doing for end users, and how end-user computing was benefiting IS. Respondents believe, for example, that end-user computing:

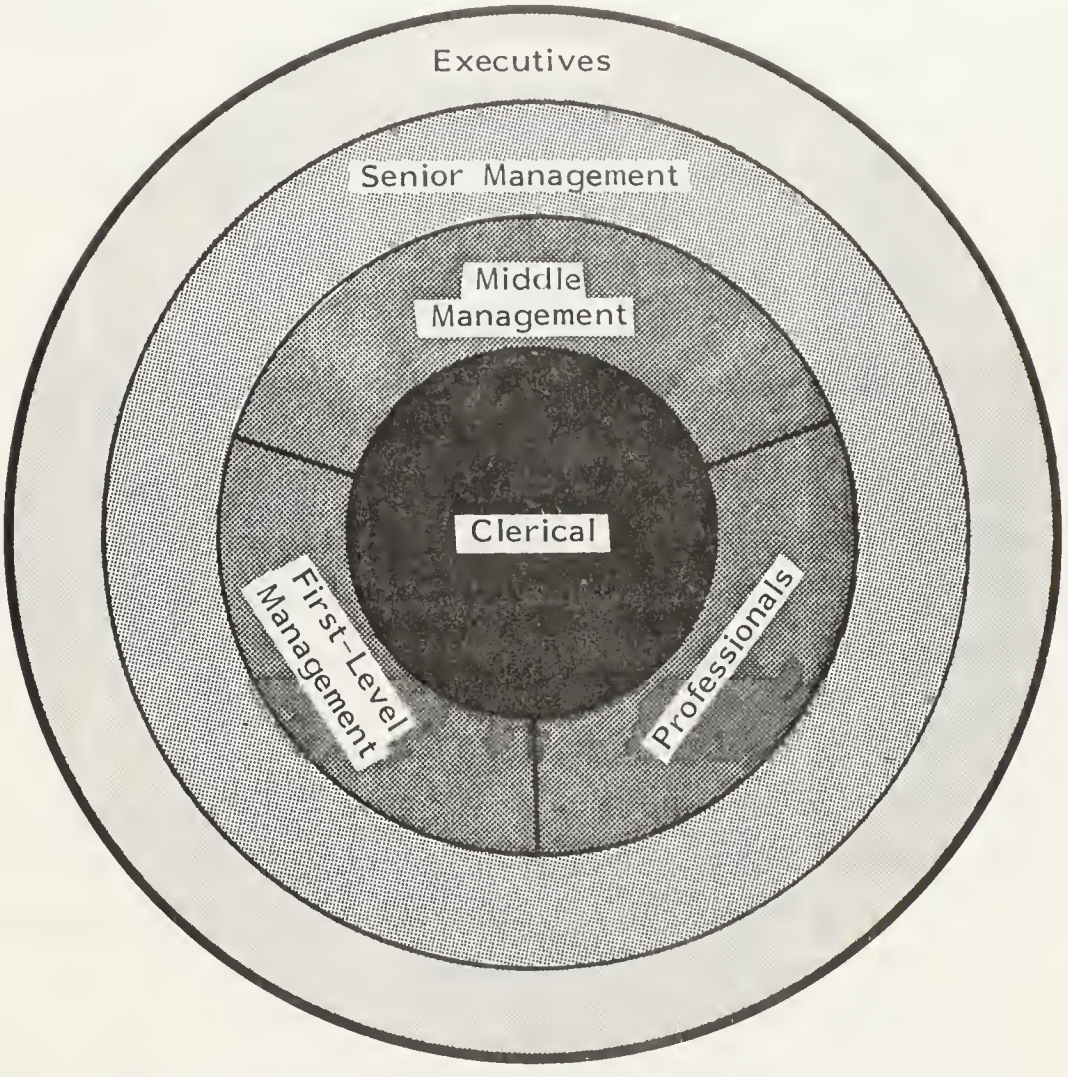
  - Improves responsiveness to end-user needs.

  - Gets users more involved with problem solutions.

  - Satisfies ad hoc reporting requirements.

EXHIBIT IV-2

DIRECT USE OF COMPUTER SYSTEMS
TO INCLUDE ALL LEVELS BY MID-1990s



1970s

Mid-1980s

Late 1980s-Early 1990s

Mid-1990s

- Relieves IS backlog pressure.

- Helps end users gain better understanding of the technology.

- Allows end users to become more aware of the effort required to build systems.

- Offloads work from the mainframe to micros.

- Makes end users more aware of data management problems.

- Frees programmers for larger applications.

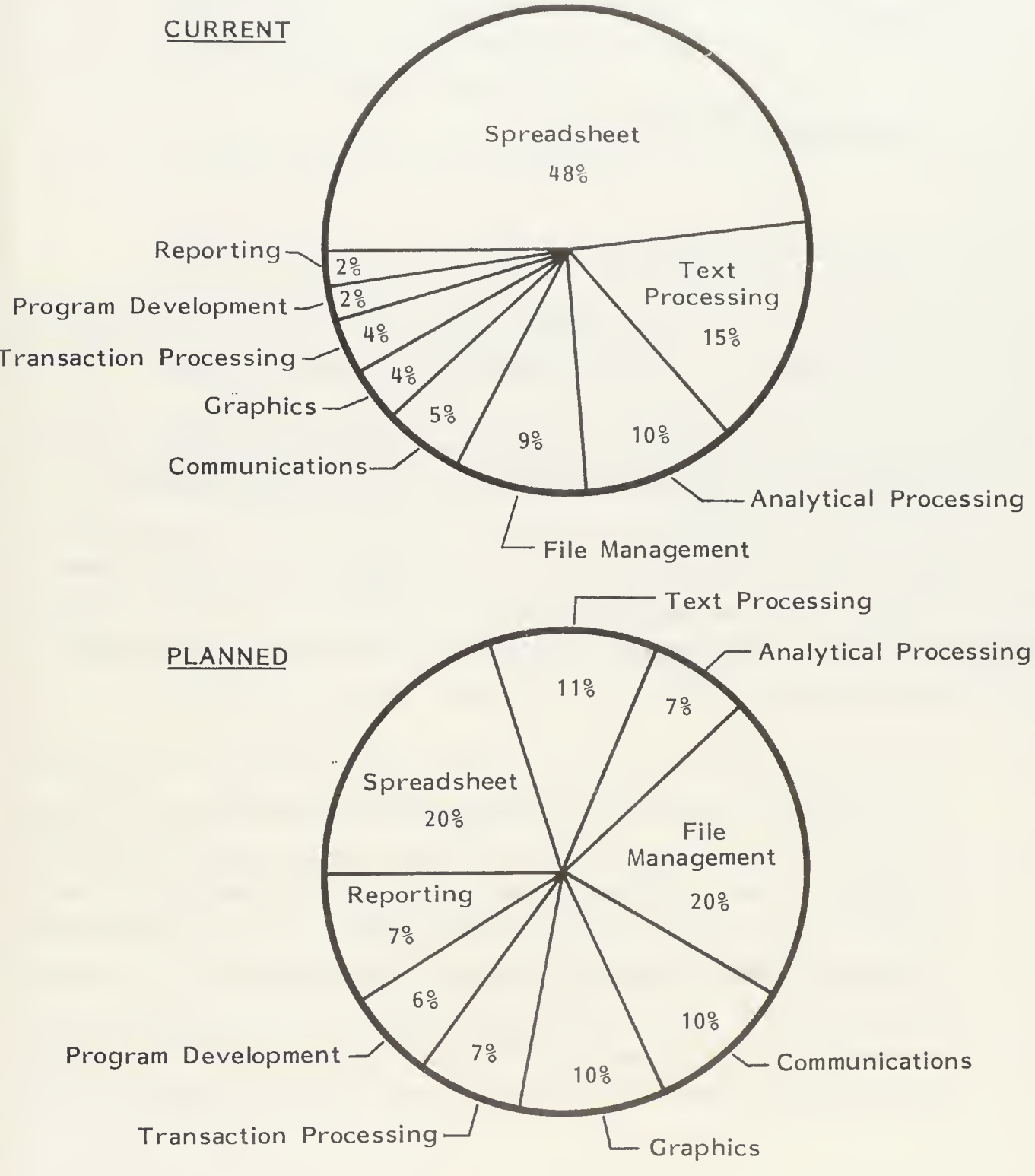
- Reduces the cost of programming.

- When asked for their views on where end-user computing was headed, IS organizations unanimously pointed to micro-mainframe links. They all agreed that end-user computing would not play a significant role in reducing the requests for information services until end users have ready access to corporate data bases.

- Exhibit IV-3 indicates the shift from standalone spreadsheet and text processing to communications and file management. Note that end-user applications involving program development, reporting, and graphics are planning to more than double their shares of the total end-user computing efforts. Transaction processing will nearly double. All of this means that end-user computing will become an integral part of future corporate systems design and that information systems will be distributed throughout organizations. As pointed out earlier in this report, network planning, especially local area networks, should take into consideration the future impact of end-user involvement in computer-related activities.

EXHIBIT IV-3

END-USER APPLICATIONS EMPHASIS
CURRENT VERSUS PLANNED



- INPUT forecasts that by 1988 more than a quarter of installed mainframe applications will be micro-mainframe applications. The challenge for IS will be to make certain that end users do not lose sight of corporate business objectives when developing applications for their local needs. Mapping out an information systems plan can serve as a guide for end-user computing consultants.

B. AUTONOMOUS DISTRIBUTED I.S.

1. DUPLICATE I.S. CAPABILITIES

- Distributed data processing (DDP) conjures up a much greater variety of computer network configurations than the typical star network that has remote minicomputers connected to a central host mainframe. The star network allows the remote computers to function independently; each can communicate with the central host but not directly with each other. As mentioned earlier, IBM favors the ring network whereby an organization can have computers of various sizes and configurations strategically placed in major divisions and supporting local needs. At the same time, the organization can have data communications capabilities with any other computer in the network.

- Many large discrete manufacturing companies have multiple IS organizations for their major divisions. There is normally a corporate IS function that sets policies and issues standards. But to all intents and purposes the individual IS organizations are autonomous: they have their own development staffs, technical support, and data centers; they select their own hardware and software and can have their own networks. They must abide by the rules and regulations set by corporate IS (including requiring written approval for major acquisitions), but other than that they are fairly self-contained. Transactions for integrated systems are transmitted to the corporate mainframe via the

ring communications network, which also permits interchange of data with other divisions.

- Large insurance companies, on the other hand, may maintain numerous duplicate data centers to support the data processing needs of the various regions. However, all applications development and hardware and systems software selection are the responsibility of the corporate IS organization located at the company headquarters.

2. COORDINATING THE PLANNING EFFORT

- INPUT believes that the majority of the computer processing power will be distributed throughout the divisions and departments of most large firms by 1990--not only in the form of mainframe data centers as described in the previously mentioned examples, but also in the form of programmable terminals or intelligent workstations. There will be varying degrees of distributed data processing from autonomous IS organizations to individual workers maintaining their own data bases and applications programs.

- As illustrated in Exhibit IV-4, corporate information systems planning in a DDP environment will require a greater coordinated effort in the future, with computer capabilities potentially spreading to every office worker. Planning must be accomplished through the collaboration of individuals representing the following areas:

  - Corporatewide systems development.

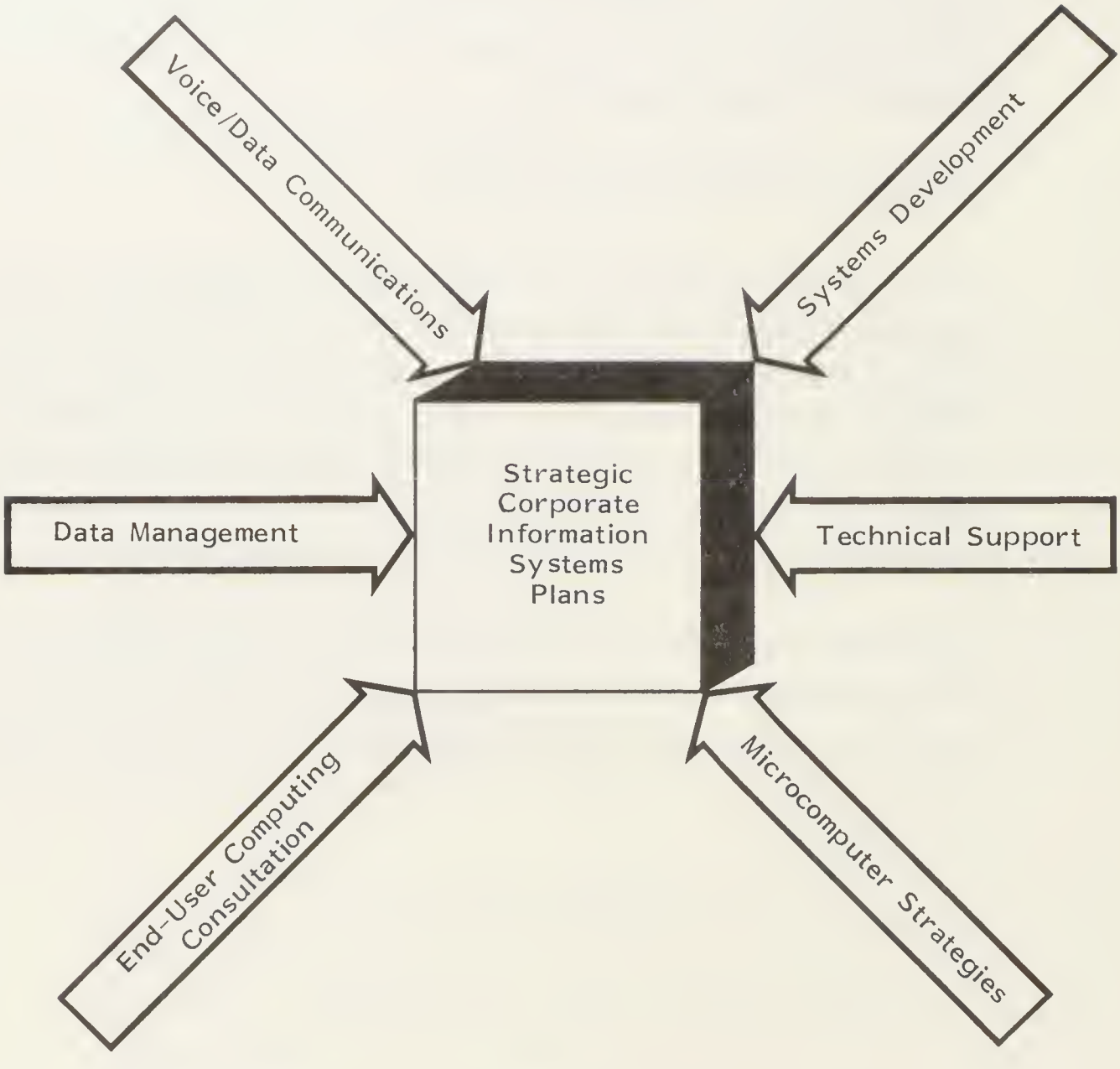
  - End-user computing consultation and support.

  - Corporatewide systems programming (tech support).

  - Voice/data communications.

EXHIBIT IV-4

INFORMATION SYSTEMS PLANNING
(DDP Environment)



- Data management.

- Microcomputer strategies.

- Distributed data processing strategies are unfolding at the major micro/mini suppliers such as AT&T and Digital Equipment Corporation (DEC). Each strategy offers local area networks that allow microcomputers to communicate with each other and interact with a host server. The server can control shared resources for the micros such as disk drives and printers and can act as a gateway to mainframes. Through the host server, connection to mainframes and/or minis can be provided through SNA, Ethernet-type networks, or X.25 networks. These strategies from the major micro/mini suppliers are good indications that distributed data processing is the wave of the future.

- In a distributed environment it will be very important for corporate IS to employ a strong security officer who establishes standards and procedures on security and control issues to all departments that have installed computer equipment. The security officer should be responsible for the selection of security software for micros, minis, or mainframes, and should also establish violation procedures.

C. DISTRIBUTED SYSTEMS DEVELOPMENT

1. PROGRAMMING AT THE BUSINESS UNIT LEVEL

- With computer power moving at a rapid pace toward end users through micros, the information center, and office systems, it has become increasingly more difficult for corporate IS to provide the needed expertise to all areas of the business. One traditional approach has been to establish separate systems development groups within IS for each major division of the organization. These groups of programmers and analysts report to IS management but are

assigned to applications directed at specific functions. This has been a fairly satisfactory approach to assure systems support to the various business units. There are some drawbacks, however.

- The human resources are under control of IS.
  - IS must justify the budget allocation.
  - End-user departments must work through IS for support.
- Administering chargeback for systems development is awkward and inaccurate.
- Corporate systems development groups tend to overlook the information needs of individual end users.

- One innovative approach to systems development support that should be considered is removing the programmers and analysts from IS and assigning them to the business units being serviced. This gives line management the total responsibility for staffing and recruiting the systems development function. This will certainly have an immediate positive effect on the IS-user relations, with line management in charge of their own systems development staffs.

- In this scenario, corporate IS would retain responsibility for the corporate data center (host mainframes and systems software), hardware/software acquisitions, communications, training, standards, and corporate financial systems. There could be an information center, but much of the applications planning would be done locally by the systems development staffs. This would also hold true for micro-based systems and micro-mainframe-based systems. The local systems development staffs would be responsible for the total information services needs of the business units to which they are assigned.

2. IMPACT ON CENTRAL I.S.

- When the systems development function is dispersed to the outlying departments of an organization, corporate IS's primary responsibility will become resource planning; secondary responsibilities will be there associated with technical consultation. Capacity planning, network planning, and systems software (mainframe/micro) planning are the areas that will require IS expertise. To assemble the most cost-effective computer-oriented tools, IS will become a body of technical specialists sifting through the myriad of products being offered by numerous hardware, software, and communications suppliers. The integration of applications for corporate information systems and the management of the associated data will also be IS's responsibility.

- There are negative ramifications associated with the dispersement of programmers and analysts to the various business units. These problems include:

  - Possible redundancy of personnel and the inability to shift human resources as required.

  - Dissemination and enforcement of standards more difficult to realize in a decentralized systems development environment.

  - Compensation parity may pose a problem among the programmers and analysts assigned to different management groups.

  - Career paths of the systems development professionals may be more limited in the decentralized environment.

- Distributed systems development requires a coordination function within the corporate IS organization. This job could be given to the manager of corporate systems, who would have the responsibility for:

- Systems development personnel job descriptions.

- Wage and salary administration for systems development personnel.

- Early communication of corporate policy and standards updates to distributed systems development groups.

- Chairing the joint planning meetings of all systems development groups.

- Corporate financial systems development and application integration.

- Coordinating the interdepartmental transfer of systems development staff members.

- The individual programmers and analysts could aspire to management positions within their own systems development groups or they could set their career sights on line management positions within the business unit being serviced. INPUT believes that more open line management positions will be filled from the systems development ranks in the future, because these individuals will possess the desired mix of business and technical skills.

3. IMPACT ON THE I.S. PLANNING PROCESS

- Depending on the size of the organization, decentralized systems development groups could be assigned to departments within divisions or at the divisional level only. The main advantage of assigning programmers and analysts to the actual business units being serviced is that they become a working part of those units and, therefore, possess a detailed knowledge of what is needed to improve productivity and/or increase the firm's competitiveness.

- Integrating systems development into the company's business operations puts the first-level and middle managers in a better position to understand the

consequences of proposed computer-based systems. Advisors would be subordinates who would be professional information systems specialists.

- The information systems planning process would start at the departmental level, as depicted in Exhibit IV-5. This would include planning statements outlining the information systems issues related to business operations, office systems and personal computing, and the corresponding proposed initiatives that are being recommended for consideration. This planning information would be forwarded to the divisional executives who would then attend a joint planning session with corporate IS representatives and other divisional executives. The executives would come to the strategic planning meetings well informed of the issues facing their operations through the bottom-up planning approach.

- Based on the planning input from the various business units and the priority setting by the executives, corporate IS would then be in a position to project resource requirements and develop the hardware and software architecture to handle the approved initiatives. The planning process under these circumstances would follow the steps outlined in Chapter III (Exhibit III-3).

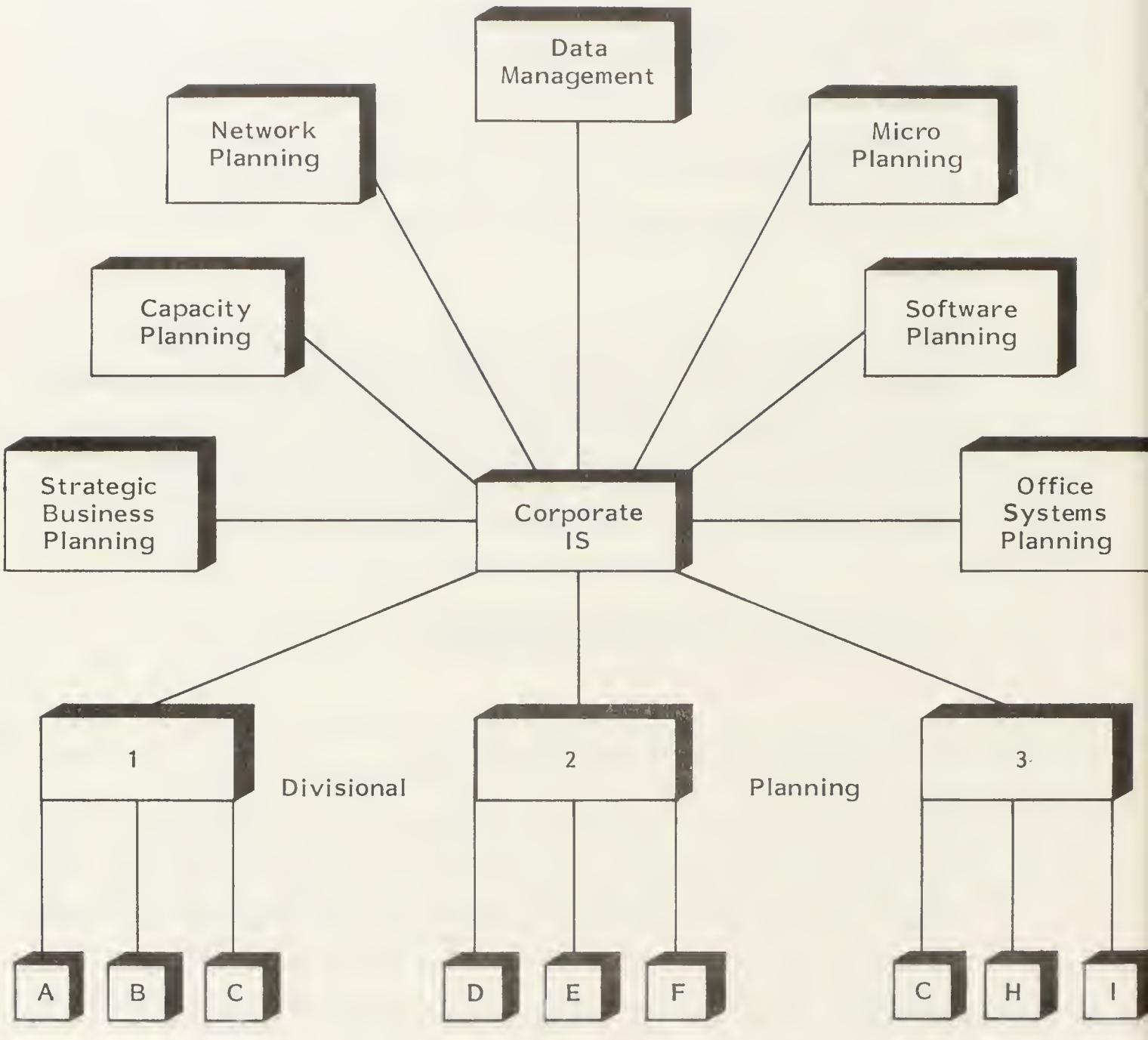
D. TELECOMMUNICATIONS CONSIDERATIONS

1. REQUIREMENTS AND NETWORK PLANNING

- When considering local area networks (LANs), be certain to look well enough into the future to see what you might need to transmit. Remember that coded data require only hundreds of characters (thousands of bits) per screen, but that coded images require hundreds of thousands of bits per screen. Noncoded information such as voice and full-motion color images can require from 64 K-bits/sec up to 2 M-bits/sec.

EXHIBIT IV-5

DECENTRALIZED SYSTEMS DEVELOPMENT
BOTTOM-UP PLANNING



Departmental System Development Planning

- From IBM's standpoint, LANs are considered a subset of network office systems under SNA and will become progressively integrated. LAN connectivity through SNA will provide communications interfaces between various products through many architectural approaches, from simple PBXs to worldwide systems. Ultimately, LANs should accommodate speeds in the 10-1,000 M-bytes/sec range.

- IBM software architecture for networking of office systems includes:

  - Document Content Architecture (DCA). This will permit content definition (including voice notation) and will cover creating, editing, formatting, and presentation.

  - Document Interchange Architecture (DIA). This will permit information to be stored in documents and in appropriate document library services. The information covers distribution, filing, retrieving, searching, information description, and application control.

- IBM believes the ring network topology is the most reliable and versatile of the various network approaches, primarily because backward transmissions are possible if breaks occur. Ethernet's bus approach, for instance, presents problems when something goes wrong, because it is difficult to pinpoint the problem. Approaches like WangNet are easy for cabling buildings, but they also suffer from the bus approach's problems in diagnosing failure causes.

2. TRENDS IN COMMUNICATION SERVICES

- The future will bring more offloading of host mainframe workloads to intelligent workstations and minicomputers. INPUT believes it is IBM's strategy to control the distribution of computer power, for obvious reasons. SNA is IBM's key to assuring maximum hardware placement through the control of network development.

- The objectives of SNA for the remainder of the 1980s are as follows:

  - Very large network support with expanded addressing capability will permit interconnection of networks.

  - Non-SNA device attachments will be facilitated.

  - There will be new data network attachments and enhanced network management capabilities.

  - New communication products from IBM will emphasize new functions, ease of use, and interconnection.

  - Software distribution will be incorporated under SNA.

E. APPLICATIONS SOFTWARE

1. MAKE OR BUY?

- Less than ten years ago the majority of IS managers would have said no to the idea of purchasing a proprietary software package to replace aging, major "home-grown" systems. The reasons were many, and included the following:

  - Package features don't fit the unique requirements of the company's operations.

  - The initial price of the package plus the cost to modify it will equal a greater expenditure than in-house development.

  - Maintenance will be difficult because of generalized code that is not very well documented.

- The package being considered doesn't function under IMS or other installed DBMSs.

- Flexibility is lost because enhancements are controlled by the vendor.

- Implementing new releases of the package will be difficult because of the custom modifications.

- The rising cost of IS personnel and the complexities involved in scheduling and managing huge applications software development projects has IS managers looking outside for ready-made solutions. Today there are at least 35 vendors that supply packaged accounting systems to IBM mainframe users. Systems are available for accounts payable, accounts receivable, general ledger, and fixed assets. There are a half-dozen material requirements planning systems and probably as many bill-of-materials systems. More than 20 vendors offer packages in the payroll/personnel area. The list goes on and covers applications for purchasing, order entry, marketing, inventory control, financial planning, and statistical analysis. There are vendors that supply industry-specific packages to cover areas of banking, insurance, medical services, etc.

- Exhibit IV-6 lists steps to be taken to reduce the chances of a failure in selecting an application software package for a major mainframe system. When the dust settles after a package has been up and running, the accumulated cost associated with acquiring and modifying the package could very well exceed a million dollars, so it is important to spend time up-front before making that commitment.

- Each line manager whose group will be affected by the new system should be asked to provide a list of mandatory features that the package must possess in order to meet the business needs of each function. The involved users must understand the reasons for changing business practices to fit the package architecture instead of the other way around.

EXHIBIT IV-6

APPLICATION SOFTWARE EVALUATION

- Identify Mandatory Features
- Obtain Commitment to Minimize Modifications
- Interview Architects of the Package
- Attend Training Classes
- Attend User Group Meetings
- Tour Vendors' Customer Sites
- Develop Preliminary Conversion Plans
- Assess Documentation Quality
- Identify Necessary Modifications
- Compare In-House Versus Vendors' Modification Cost
- Alter Contract to Protect Interests

- Key IS professionals and users should tour the vendors' customer sites and interview the most knowledgeable developers of the packages. To uncover any operational hurdles, IS and users should, if possible, attend classes held for customers of the package. Also, many pitfalls can be uncovered by attending a meeting of existing customers if there is such a group.

  - Be certain that the documentation meets in-house standards, because vendors have the same problems maintaining documentation as IS organizations have.

  - Before signing the contract, know the cost of modifications and resources to be used. Also be clear about what is included in the maintenance of the system and the cost of the maintenance.

  - The contract should be reviewed by legal counsel and should contain penalty clauses to cover any breach of contract.

2. PLANNING IMPLICATIONS OF PRODUCTIVITY TOOLS

- The information services industry has been attacking the systems development life cycle, hoping to shorten the duration by eliminating steps or reducing complexities. Weapons that have emerged throughout the years to spearhead these attacks have been referred to as productivity tools.

- Productivity tools come in many shapes and sizes and can be directed at different phases of the life cycle. Programming has probably received the greatest number of attacks, with COBOL being one of the first major productivity tools. Programming is still under attack and the tools are becoming more sophisticated:

  - Nonprocedural query languages.

  - Nonprocedural, parameter-driven report writers.

- Interactive screen generators.

- Fourth-generation procedural languages.

- Integrated data dictionaries.

- Relational data bases.

- Ultimately, COBOL-type programmers will become extinct, and much of the systems development will be accomplished at individual workstations by end users (with assistance from IS consultants). With the use of the tools listed above and guidance from IS, end users are able to generate applications prototypes that attack the life-cycle phases associated with systems specification.

- Alternatives for systems development must be taken into consideration during the planning process, because what might have taken years to implement under the traditional approach could very well be cut to a few months with effective use of available productivity tools.

- Slashing the time required to generate vital new systems is a major step in giving an enterprise a competitive edge.

V CORPORATE I.S. PLANNING ISSUES

V CORPORATE I.S. PLANNING ISSUES

A. CAPACITY MANAGEMENT

- Maintaining an adequate level of computer/communication services will become (if it is not already) the most challenging problem facing IS. This dilemma is a result of:

  - End-user computing demands on mainframe resources.

  - A move toward knowledge-based systems.

  - "Improved" versions of IBM's systems software.

- End-user computing is graduating from spreadsheets and word processing to information management applications that require frequent access to corporate data, along with large storage and computational requirements. End users are becoming sophisticated users of computer resources, and much of their computing activities will be beyond the control of IS. End users have the tools and know how to use them; therefore they can generate as much work as IS can handle.

- Office systems such as IBM's PROFS (PRofessional OFfice System) can be another uncontrolled drain on processing resources. Once middle and upper management become comfortable about using the computer to assist them in

their day-to-day activities, the need for CPU cycles and disk storage will be enormous.

- Knowledge-based systems are very exciting concepts that enable the computer to search through a set of facts in a manner similar to the way the human brain would search. The problem with this artificial intelligence is that solutions can require comparisons or searches that increase exponentially and could exceed the physical limits of computer technology.

- IBM's account control is primarily through its systems software. With MVS/XA, VM/SP-HPO (Virtual Machine/System Product--High Performance Option), and IMS (Information Management System), it is not surprising that more than 90% of executed mainframe CPU cycles are running IBM-generated code.

- The days of providing computer power to an organization through one IBM mainframe are over. IS must consider distributing the total computer work load over many CPUs. With office systems gaining interest from management, IS should consider all of the alternatives before making a commitment. There are several viable vendors in this area that provide integrated software that includes word processing, electronic mail, phone communications, electronic policy, calendar management, decision support, and report writing. For instance, Data General's Comprehensive Electronic Office, which operates on the DG MV/4000 superminicomputer, could be more cost-effective and expandable than IBM's PROFS, which runs on a mainframe. Likewise, Digital Equipment Corporation offers an office systems package called ALL-IN-1 that runs on their VAX 11/750 superminicomputer. Wang, Hewlett-Packard, and Philips all have multifunction office systems software and associated hardware that could fit the specific needs of an organization.

- Micro-mainframe links are also an important alternative to the capacity management problem. Applications software vendors are starting to offer packages that enable users to download data from the mainframe directly to

the microcomputer user's applications. INPUT predicts that 80% of all computer power will be distributed to microprocessors by 1990. This means that systems development activity must include plans to utilize the capabilities of microcomputers to relieve the demand for CPU cycles from the mainframe.

B. DATA MANAGEMENT

- The emphasis in this area is on the need for end users to duplicate on their personal computers some of the data that is maintained by the host mainframe. The most straightforward way to accomplish this task is to have the data rekeyed onto the microcomputer's storage devices. This, of course, is undesirable due to the time involved and the possible inaccuracies introduced.

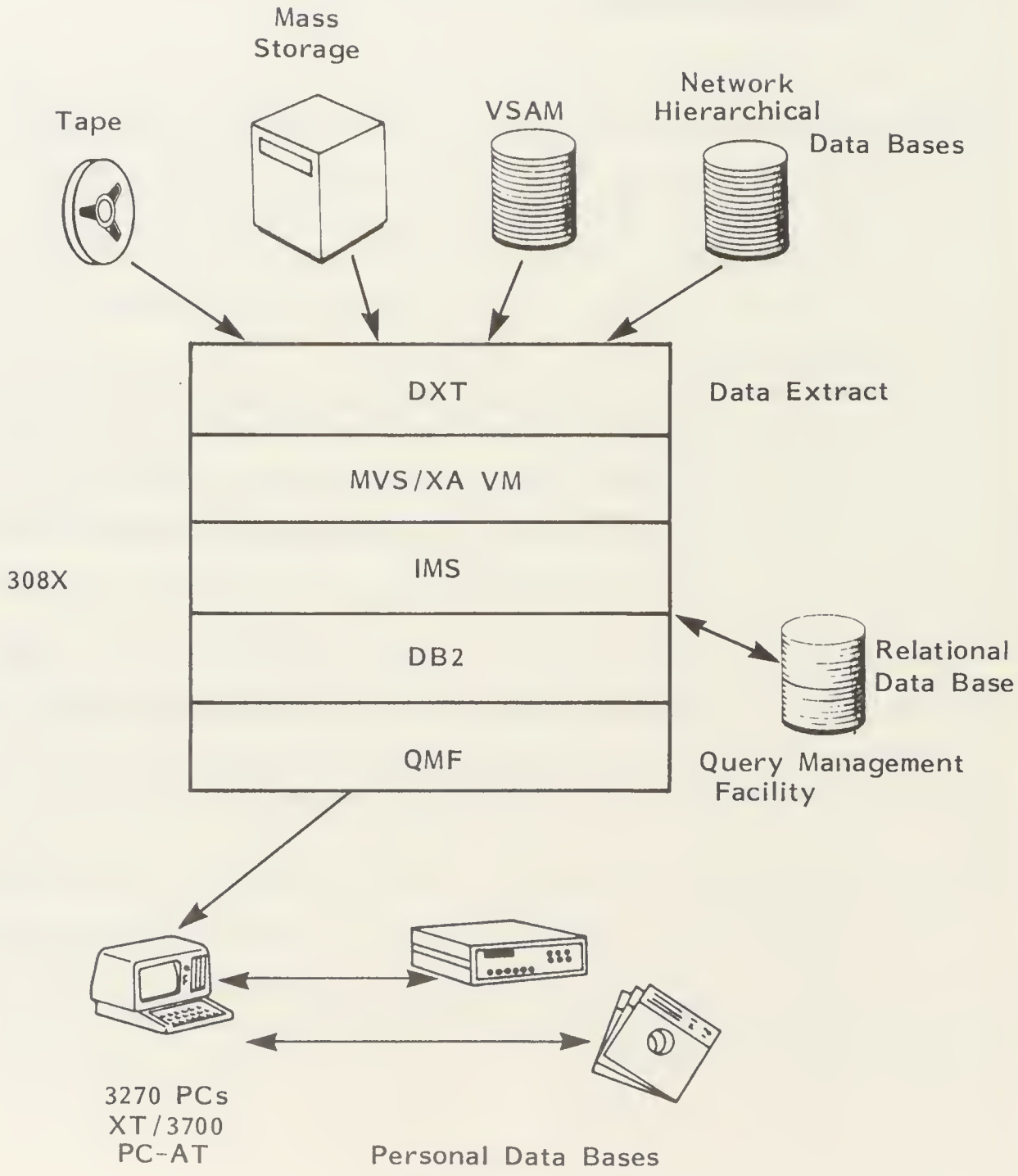
- INPUT suggests approaching this problem with caution and trying a pilot data downloading before making it universally available to all personal computer users. Although downloading technology has just gotten underway, the next generation of products is imminent because of the potential market that has been created by end-user demands.

- Most of the major suppliers of proprietary software packages (MSA, Cullinet, McCormack & Dodge, etc.) are offering micro-mainframe link software that should be investigated if applications packages are used. There is much more on this subject in INPUT's End-User Micro-Mainframe Needs (July 1984).

- IBM's data base architecture, as depicted in Exhibit V-1, is an integration of several systems software products and is directed at 308X processors running under MVS/XA/IMS/DB2. INPUT is concerned with the possible degradation of performance when droves of end users initiate extracts from host files through their intelligent workstations.

EXHIBIT V-1

IBM's DATA BASE ARCHITECTURE



- Before jumping automatically to IMS/DB2 for a data base solution, try to envision the information systems environment three to five years down the road. Then investigate the plans of the major data base vendors to determine which is most likely to provide the best fit.

C. STAFFING AND RECRUITING

- INPUT believes that future IS organizations will primarily consist of a group of specialists. These specialists will act as consultants to the rest of the organization; there will be hardware specialists, systems software specialists, and communications specialists. There will also be business systems specialists for each operational segment of the enterprise.

- Because of the emphasis on distributed systems development and end-user computing, the IS business systems specialist should possess the following types of skills:

  - Interpersonal communications.
  - Diplomacy, tact, and patience.
  - Understanding of users' business needs.
  - Teaching ability.
  - Consulting techniques.

- More than ever before, the IS-user relations must foster cooperation. IS must project a proactive image that encourages end users to turn to IS for guidance and assistance. INPUT's report, Future Skills Requirements for Software Development, September 1984, points out that companies are now starting to

looking for raw recruits with degrees in the humanities or social sciences rather than in computer sciences, because it is believed that the former will adapt more readily to the business environment and will be more competent in human relations skills.

D. CONTROLLING I.S. COSTS

1. TRENDS IN CHARGEBACK SYSTEMS

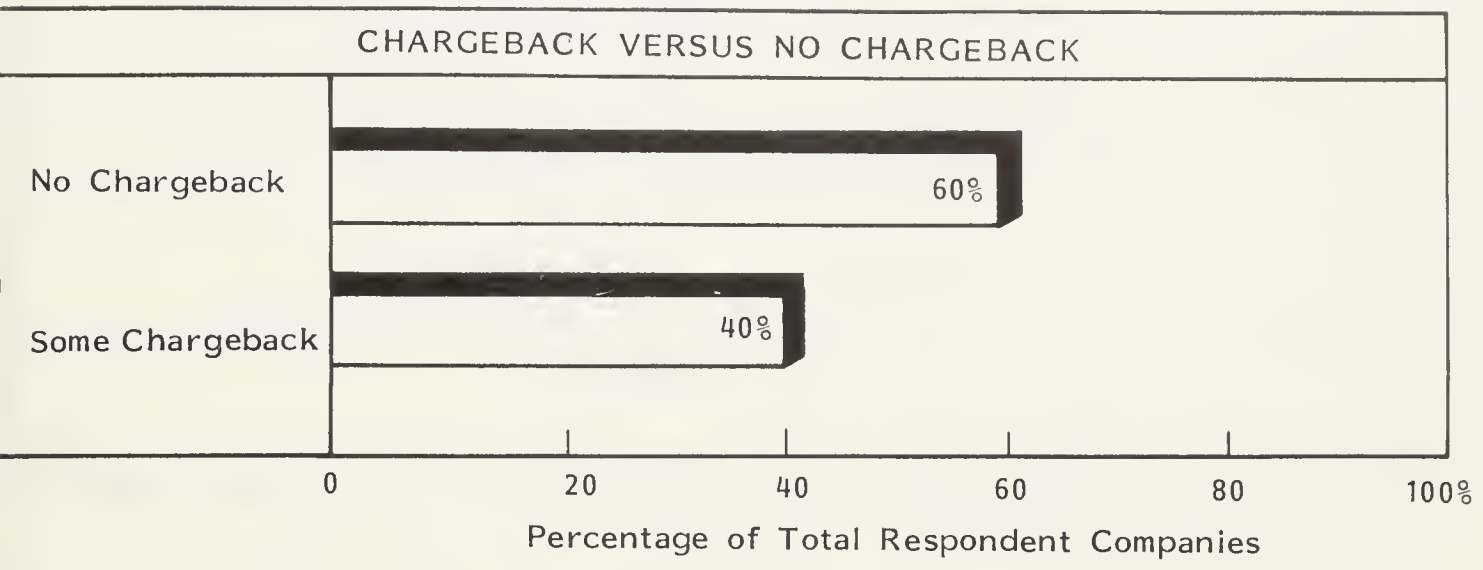
- Forty percent of the respondents to this study claimed to have some type of chargeback system. Nearly 100% of the organizations that do have chargeback systems are charging the users for operations resources. Fifty percent of the organizations having chargeback systems also account for programmers' and analysts' time (systems development). Of the 40% that said they did charge for IS services, 32% claimed their systems covered the entire IS budget. Exhibit V-2 illustrates this breakdown. The 40% will move to 50% by the end of 1985, which indicates management's desire to improve control over IS.

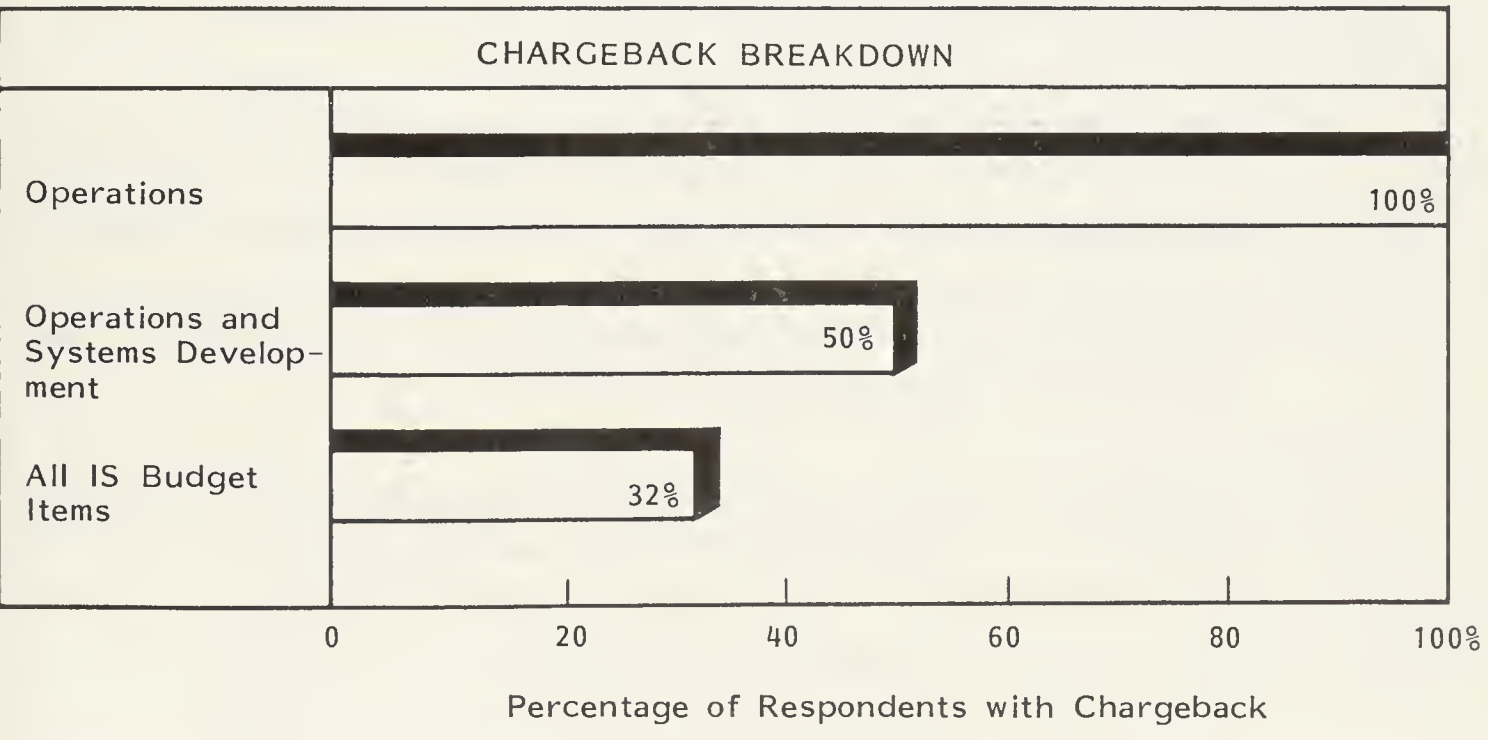
- Some IS organizations are offering rental arrangements to end users on personal computers. In these companies IS purchases the equipment, amortizes it over two years, and then rents it at cost on a monthly basis. This provides an economic incentive to acquire the personal computers from IS and also helps in controlling standardization. Personal computers can be returned to IS if they don't work out as planned.

- It is important to charge back time used at the information center to control frivolous uses of the resources. This is normally done by prorating time-sharing costs among all users based on resources used and peripheral equipment needed.

EXHIBIT V-2

CURRENT TRENDS IN CHARGEBACK SYSTEMS





- There are numerous chargeback software packages available for IBM 43XX and up. When evaluating these packages, consider performance-monitoring capabilities. The package can first be installed to monitor performance and provide job accounting information before a formal chargeback system is implemented. For instance, Pace Applied Technology offers its Komand package, which combines performance monitoring with a chargeback system.

- There are four objectives of chargeback systems. The objectives are:

  - To identify the cost of information services for the various using departments (input to product cost accounting).

  - To control unjustified use of existing capacity.

  - To ensure cost-effective IS operations.

  - To provide incentive to use less expensive windows of time (capacity management).

2. CHANGING JUSTIFICATION CRITERIA

- As mentioned in Chapter III, organizations have started to realize the opportunities available in applying computer technology to areas of the business that will have a direct impact on sales and market share. Even though operating-cost reductions are important factors to consider when evaluating an information systems proposal, more important is the system's ability to get the jump on the competition at the marketplace.

- Proposals involving the use of computer-based resources should be evaluated on the following factors, any of which could justify approval:

  - Improved interdepartmental communications.

  - Reduction in operating costs.

- Improved customer service.

- Reduction in product development time.

- Effective decision support development information.

- Improved time management.

- Improved quality control.

- Effective market evaluation and sales forecasts.

E. END-USER COMPUTING SUPPORT

- Much of INPUT's 1984 research energy went into the topic of end-user computing because that was the number one concern of the clients. Some companies have had end-user information centers for several years, but many companies are just installing their information centers. IS organizations are beginning to accept the idea that microcomputers are here to stay and will play an ever-increasing role in the overall information systems strategy.

- Throughout this report the many issues related to end-user computing have been discussed because INPUT believes that all planning for the use of computer-based resources should be initiated and coordinated by corporate IS.

- The main point to be stressed under this section is that microcomputer and office systems capabilities should be included in the planning process for information systems. Be certain that the systems development staffs understand these capabilities and that the end-user support groups have a business perspective. If at all possible, rotate the mainframe programmers and analysts through the end-user support groups (information center) to help them become familiar with problems and products.

VI CONCLUSIONS AND RECOMMENDATIONS

VI CONCLUSIONS AND RECOMMENDATIONS

- The extraordinary advances in electronic technology over the past decade have made it possible to put on the desk tops of the office workers inexpensive computers that house many megabytes of disk storage and nearly a megabyte of RAM and have CPU speeds that would have been the envy of mainframe users only a few years ago.

- The reliability, efficiency, and cost of emerging digital communications services are making it possible for corporations to develop networks that can transmit voice, data, and images between facilities instantaneously.

- Office systems have progressed and offer features that provide considerable time management improvements and paper shuffling reductions. These systems will be as necessary to future organizations as typewriters and telephones are today.

- The capability of the computer is moving out of the hands of the central corporate IS organization and into the business units being serviced. This distribution of computer power brings with it changes in the approaches to systems development and, ultimately, changes in the role of corporate IS.

- The country is in the midst of a computer technology revolution, and the organizations that survive will be those that have learned to put the technology to work to gain a competitive edge. Those enterprises that view computers as nothing more than tools for accounting and controlling will have

a tough time keeping up with competitors that seek out information opportunities directed at:

- Providing value-added service to customers.
- Leveraging price through reduced product costs.
- Reducing production cycles and improving quality.
- Improving decision support information.
- Improving utilization of management talents.
- Facilitating creativity and the exchange of ideas.

- IS must assess its portfolio of applications that are servicing its enterprise to determine what portion of the information systems resources is being directed at improving corporate competitiveness. This assessment should be presented to senior management along with comparisons with the industry leaders on how they are putting the technology to work.

- Corporate information systems planning cannot be effectively accomplished in isolation by some staff function reporting to the IS manager. There needs to be a dialog between the IS planners and middle management and between those two entities and senior management.

- Middle management is in the best position to ascertain the real strengths and weaknesses of the organization. These managers should know how the business systems are actually functioning, and they should be the best source of ideas for competitive improvements. With their concepts and with IS's understanding of the technology and how others are using it, proposals can be presented to senior management for consideration.

- Senior management must include IS as an integral part of the strategic business planning process and place IS in the role of technical consultant. IS should be prepared to advise managers about competitive systems strategies.

- Getting senior management to recognize the importance of IS's contribution to the development of strategic business plans is a challenge that IS must meet. There are several approaches that can be taken to enlighten management's view of IS's potential impact on the competitiveness of the corporation. Managers may:

  - Invite executives to computer technology familiarization courses.

  - Have vendors manage tours of model facilities.

  - Employ the services of a management consulting firm.

  - Forward articles and studies (such as this report) on the subject of planning to the executives.

  - Request time for a formal executive presentation.

- Systems strategies should include the integration of services (micro-mainframe, local area networks, office systems, information center, micro-minis, SNA networks, etc.) whenever feasible. INPUT believes the total systems approach of the future will involve the sharing of resources and the exchange of information through distributed data bases. Planning for the future should include personal computer networks that connect to SNA networks that provide complete micro-micro-mainframe, two-way communications. Competitive enterprises will be those with effective information networks that eliminate the barriers of time and space between the operational pieces of the whole entity.

- The technology alternatives are so vast--and the list of suppliers seems to grow exponentially--that it becomes extremely important for IS to conduct a thorough evaluation of the available products for each aspect of information systems. Today's solutions should be easily converted to, or replaced by, tomorrow's solutions; in other words, because of the recent explosion of interest in information technology, products should be selected with potential growth in mind. Integration ability is the key: Will it be possible to integrate the product with the total system of the future? If it is a unique standalone product, will it be able to handle the demands of the future?

- IS has the opportunity to play a significant role in the future viability of enterprises within every industry. There is no standing still; the challenge is to discover innovative ways to employ computer technology to increase an organization's chances for a greater market share and increased sales, or to provide better public service at a much reduced cost.

APPENDIX: QUESTIONNAIRE

1. How many workstations (terminals, personal computers, etc.) does your company have connected to mainframe computers? _____ (1)

   What percent are:
   - ☐ Microcomputers _____ (2)
   - ☐ "Dumb" Terminals _____ (3)
   - ☐ Intelligent Workstations (Other than Micros) _____ (4)
   - ☐ Other _____ (5) _____ (6)

2. Does your company have remote/distributed computing (not including stand alone personal computers?) ☐ Yes ☐ No (7) (If no, go to No. 6)

3. Which applications run on remote/distributed computers?

Application	Total Number of Users	Number of Managers	Number of Professional Personnel	Number of Support Personnel
Office Systems	(8)	(9)	(10)	(11)
Financial/ Accounting	(12)	(13)	(14)	(15)
Inventory	(16)	(17)	(18)	(19)
Personnel	(20)	(21)	(22)	(23)
Other _____	(24)	(25)	(26)	(27)
_____	(28)	(29)	(30)	(31)
_____				

4. What growth rate do you project for the remote computing applications in the next 5 years? _____ (32) Will any user group grow faster or slower than this rate?
   ☐ Yes ☐ No (33) (If no, go to No. 6)

5. What will be the growth rate for the following types of users over the next 5 years?
   Total _____ %

   Managers _____ % (34)
   Professionals _____ % (35)
   Support _____ % (36)

6. Does your company have a corporate data base? ☐ Yes ☐ No(37) (If no, go to No.

7. How would you define your corporate data base?

☐ Extract of application files(38)

☐ Access to production files(39)

Code

☐ Other _____ _____(40)

_____ _____(41)

_____ _____(42)

8. How often is your corporate data base updated?

(43) ☐ Daily or more frequently

(44) ☐ Weekly

(45) ☐ Monthly

(46) ☐ Other _____

_____

9. How do you control access to the corporate data base?

(47) ☐ Password

(48) ☐ Secure terminal (key or badge-controlled?)

(49) ☐ Other _____

(50) _____

10. Does your company provide for downloading of corporate data base information to remote and personal computers? ☐ Yes ☐ No(51) (If no, go to No. 13)

11. What service does your organization provide to assist downloading?

(52) ☐ Provide software on host computer

(53) ☐ Provide software on remote/personal computer

(54) ☐ Perform each download operation

(55) ☐ Training

(56) ☐ Other _____

_____

12. What security measures does your organization employ to protect the corporate data base? _____ (57)

_____

_____

_____

_____

13. Does your organization charge information systems expenses back to users?

☐ Yes

Which expenses are charged back?
(check all that apply)

(59) ☐ Computer operation expenses

(60) ☐ Programming/Analysis

(61) ☐ Entire IS Budget

(62) ☐ Other (Specify) _____ (635)

☐ No (58)

Are you planning to initiate a chargeback scheme in the next year?

☐ Yes ☐ No (63)

(If no, go to No. 19)

(For questions 14 and 15 use the following ratings: 5 = very satisfied, 4 = satisfied, 3 = Neutral, 2 = Dissatisfied, 1 = Very Dissatisfied.)

14. Rate the users' opinion of the chargeback method. Rating _____ (64)

Reason _____ Code _____ (65)

_____

_____

15. Rate IS's opinion of your current chargeback method. Rating _____ (66)

Reason _____ Code _____ (67)

_____

_____

16. How long has your organization been using chargeback? _____ (68) years.

17. Are you planning any changes in the next year? ☐ Yes ☐ No (69)

What changes are planned? _____ Code _____ (70)

_____

_____

_____

18. Is end-user equipment (e.g., personal computers, minicomputers, word processors) included in chargeback? ☐ Yes ☐ No (71)

Comments _____

_____ (72)

19. What are your top three IS-personnel-related problems and the steps you are taking to solve them?

Problem	Code	Remedies	Code
1. _____		_____	
_____	_____ (73)	_____	_____ (76)
2. _____		_____	
_____	_____ (74)	_____	_____ (77)
3. _____		_____	
_____	_____ (75)	_____	_____ (78)

20. What actions can IS take to improve its image with:

Users?

Code

_____ (79)

_____

_____

Senior Management?

_____ (80)

_____

_____

21. How many people support end-user computing?

	IS Staff	Non IS Staff
Personal Computers	(81)	(82)
Information Center	(83)	(84)
Office Systems	(85)	(86)
Other_____ (87S)	(87)	(88)
Total	(89)	(90)

22. Does your company have a group to support end-user computing? (Note - group implies a formal organizational entity, e.g., departments.)

☐ Yes - Part of IS

(91) ☐ Yes - Not part of IS

☐ No - But do have group(s) for: (Check all appropriate)

(92) ☐ Personal Computers

(93) ☐ Information Centers

(94) ☐ Office Systems

(95) ☐ Other _____ (96)

☐ No - Support on an ad hoc basis

☐ No - Do not support end-user computing (end of interview.)

23a. What are the three most important skills required to support end-users?

Code

_____(92) 1. _____

_____(93) 2. _____

_____(94) 3. _____

23b. Will these skill requirements change in the next three years? ☐ Yes ☐ No (95)

Why? _____

_____ (96)

24a. What roles are vendors playing in end user computing?

Code

_____(97) 1. _____

_____(98) 2. _____

_____(99) 3. _____

24b. Will this role change in the next three years? ☐ Yes ☐ No (100) (If no, go to No.

24c. Why, and what will be vendors' new role?

Code

_____(101) 1. _____

_____(102) 2. _____

_____(103) 3. _____

25. What are the top three benefits of end-user computing?

Code

_____(104) 1. _____

_____(105) 2. _____

_____(106) 3. _____

26. What are the three greatest dangers associated with end-user computing?

Code

(107) 1. _____

(108) 2. _____

(109) 3. _____

(THANK YOU)